US009122374B2

(12) **United States Patent**
Audet et al.

(10) **Patent No.: US 9,122,374 B2**
(45) **Date of Patent: Sep. 1, 2015**

(54) **EXPANDABLE AND COLLAPSIBLE ARRAYS OF DOCUMENTS**

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(73) Assignee: **9224-5489 QUEBEC INC.**, Montreal (CA)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 555 days.

(21) Appl. No.: **13/244,530**

(22) Filed: **Sep. 25, 2011**

(65) **Prior Publication Data**

US 2012/0198389 A1 Aug. 2, 2012

Related U.S. Application Data

(60) Provisional application No. 61/438,609, filed on Feb. 1, 2011.

(51) **Int. Cl.**

G06F 3/00	(2006.01)
G06F 3/0482	(2013.01)
G06F 17/30	(2006.01)
G06F 3/0481	(2013.01)

(52) **U.S. Cl.**

CPC ***G06F 3/0482*** (2013.01); ***G06F 3/04817*** (2013.10); ***G06F 17/30011*** (2013.01); ***G06F 17/30598*** (2013.01)

(58) **Field of Classification Search**

CPC G06F 17/30067; G06F 17/30994; G06F 17/30961; G06F 17/2205; G06F 17/241; G06F 17/30011; G06F 17/20011; G06F 17/30598; G06F 3/04817; G06F 3/482

USPC 715/234, 254, 255, 273, 854

See application file for complete search history.

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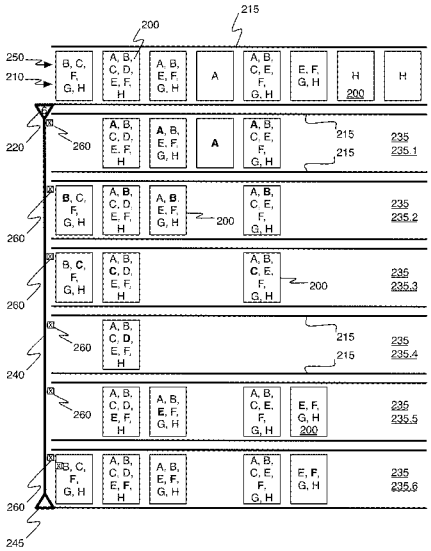
Primary Examiner — Kyle Stork

(74) *Attorney, Agent, or Firm* — Mathieu Audet

(57) **ABSTRACT**

An embodiment provides a product comprising a machine-readable medium and machine-executable instructions for causing a computer to perform a method comprising providing a first array of information elements adapted to be expanded into at least one other array of information elements on a display. Another embodiment provides a method of displaying information elements on a display of a computer system with arrays of information elements, the method comprising displaying a first array of information elements, expanding the first array of information elements into at least one other array of information elements, wherein the first array of information elements and the at least one other array of information elements have a commonality. A system and a graphical user interface providing same are equally provided herein.

20 Claims, 23 Drawing Sheets



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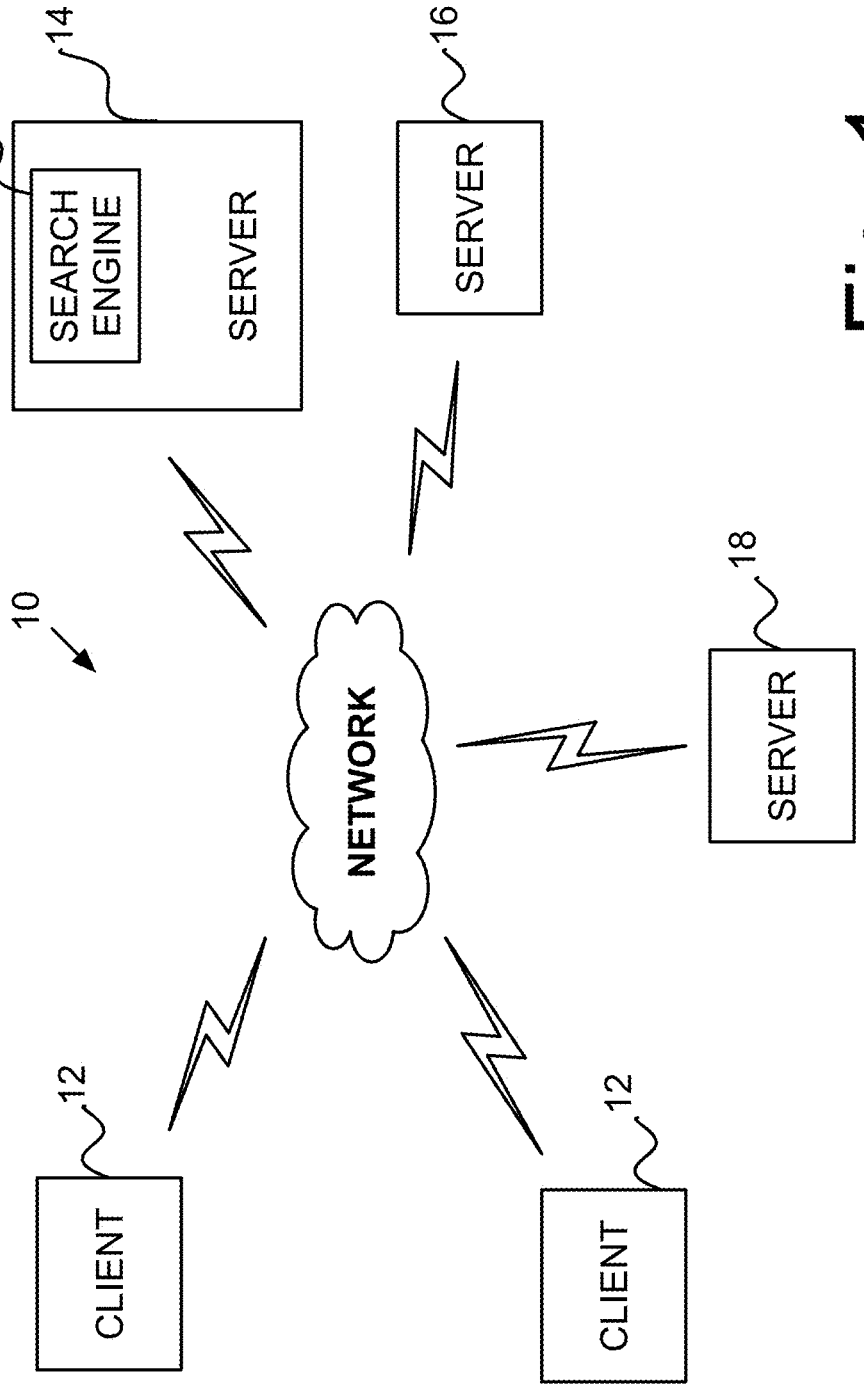
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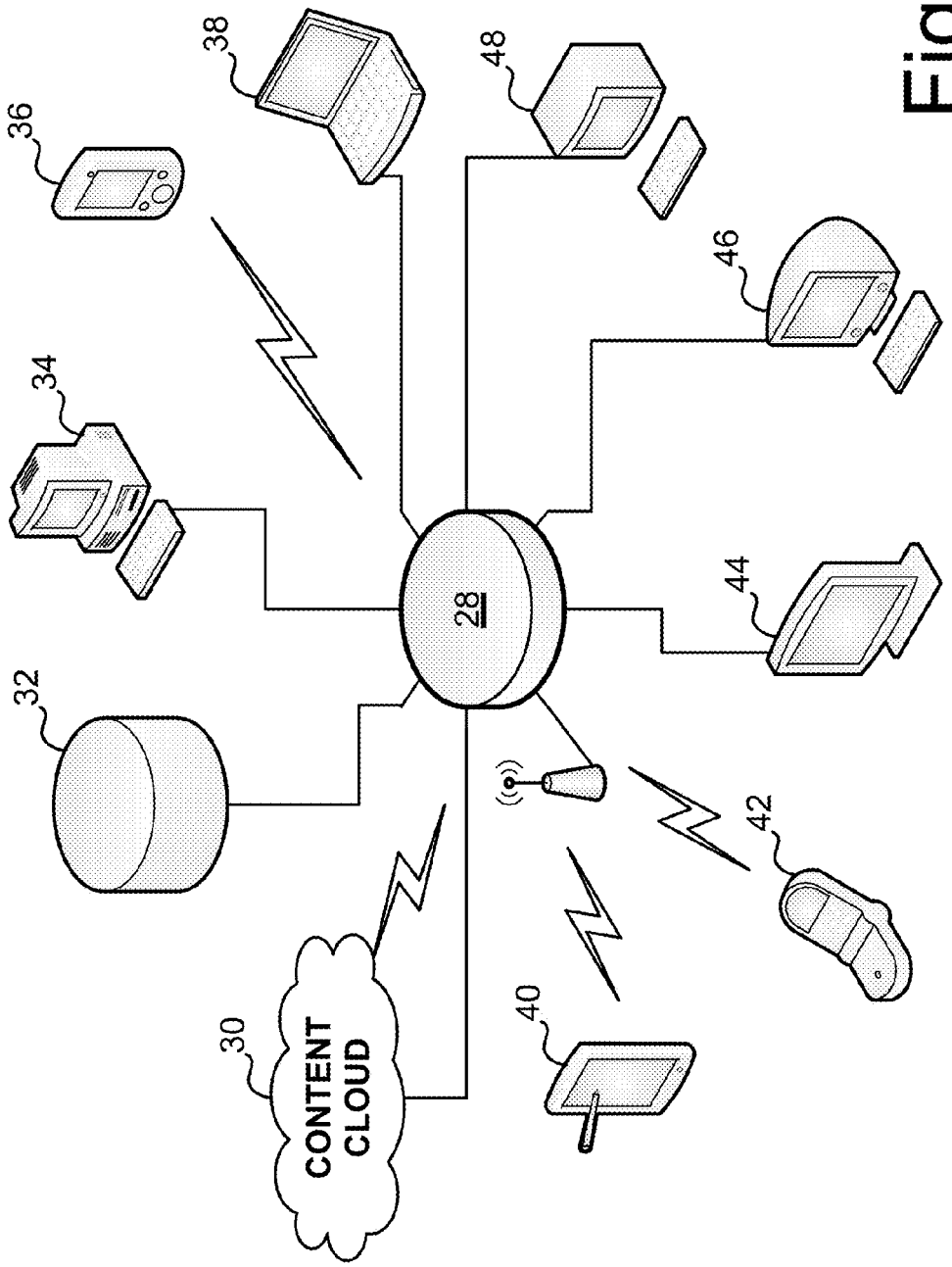

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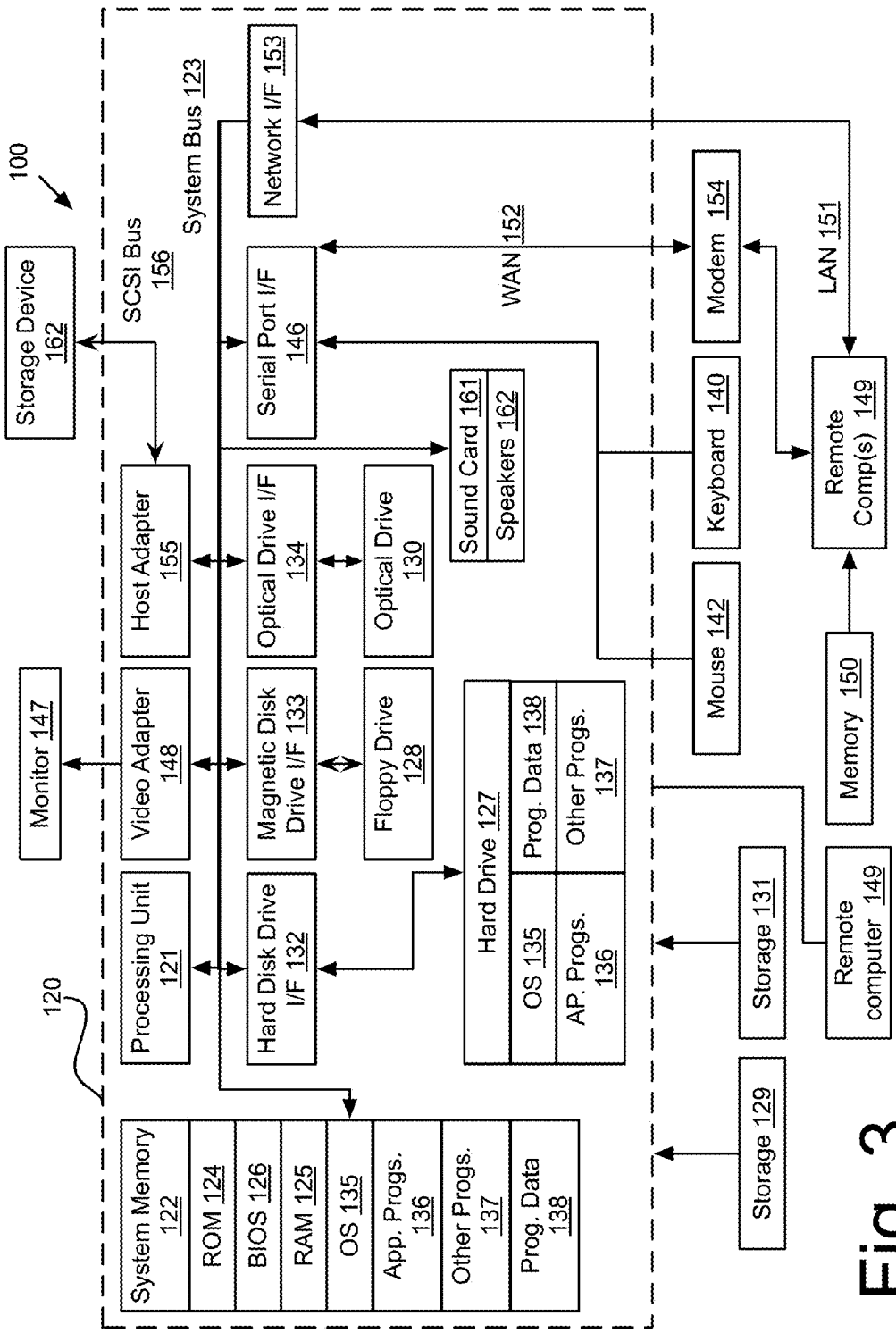
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LAN 151
Sound Card 161
Speakers 162
Host Adapter 155
Optical Drive I/F 134
Optical Drive 130
Keyboard 140
Remote Comp(s) 149
Monitor 147
Video Adapter 148
Magnetic Disk Drive I/F 133
Floppy Drive 128
Mouse 142
Memory 150
Hard Drive 127
Prog. Data 138
Other Progs. 137
OS 135
AP. Progs. 136
Processing Unit 121
Hard Disk Drive I/F 132
Storage 131
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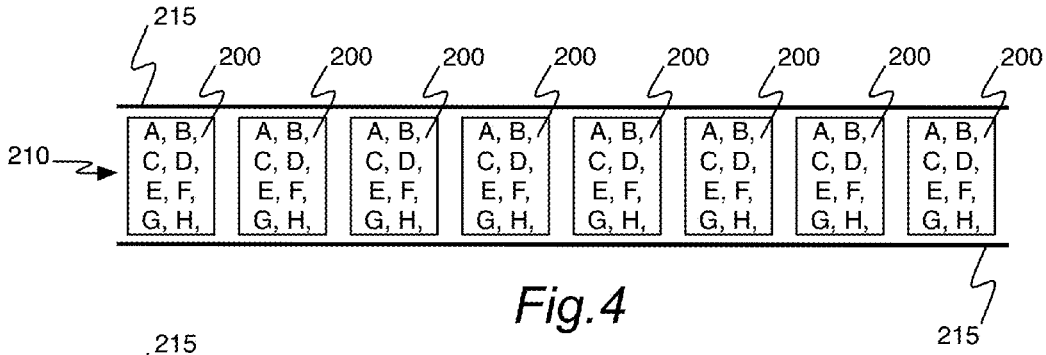
Fig. 3



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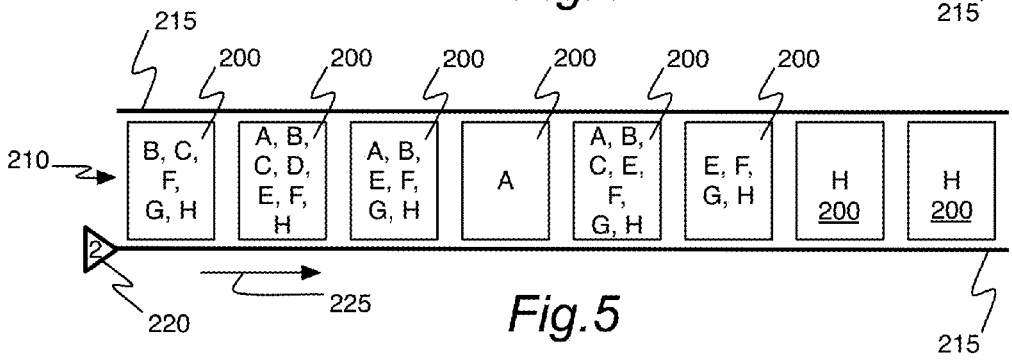

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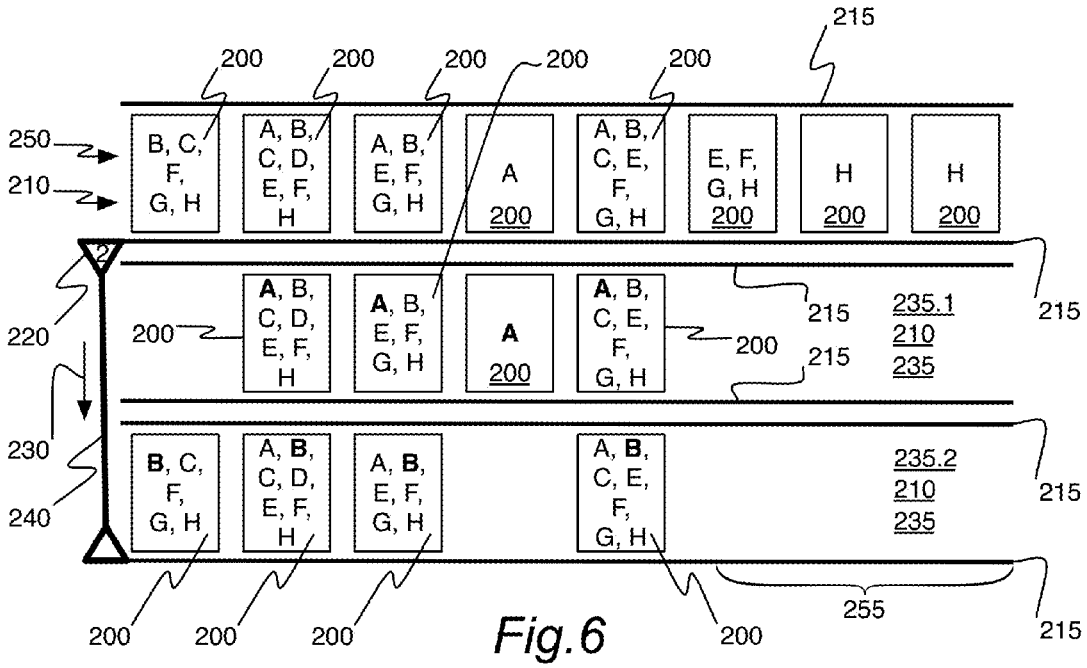

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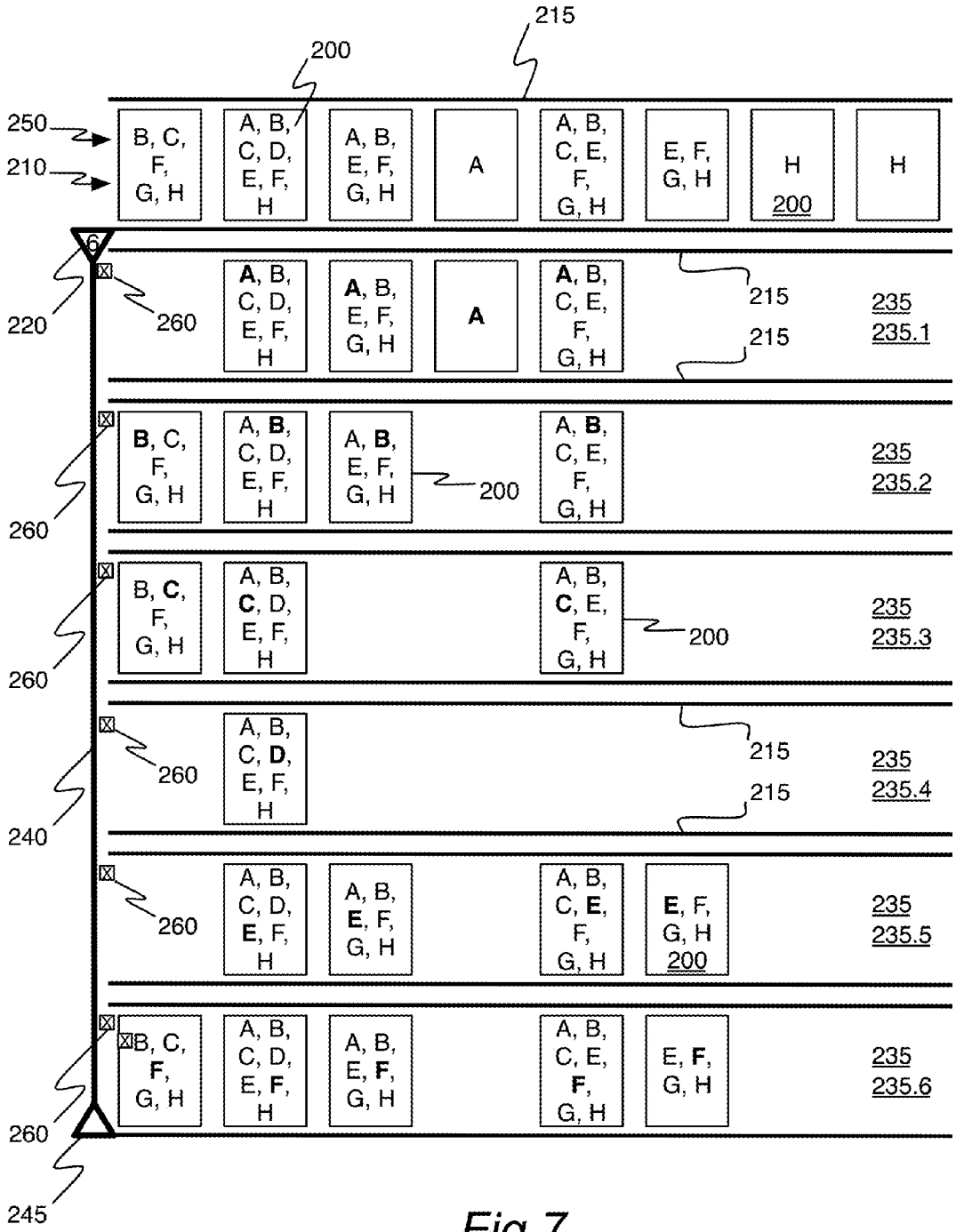
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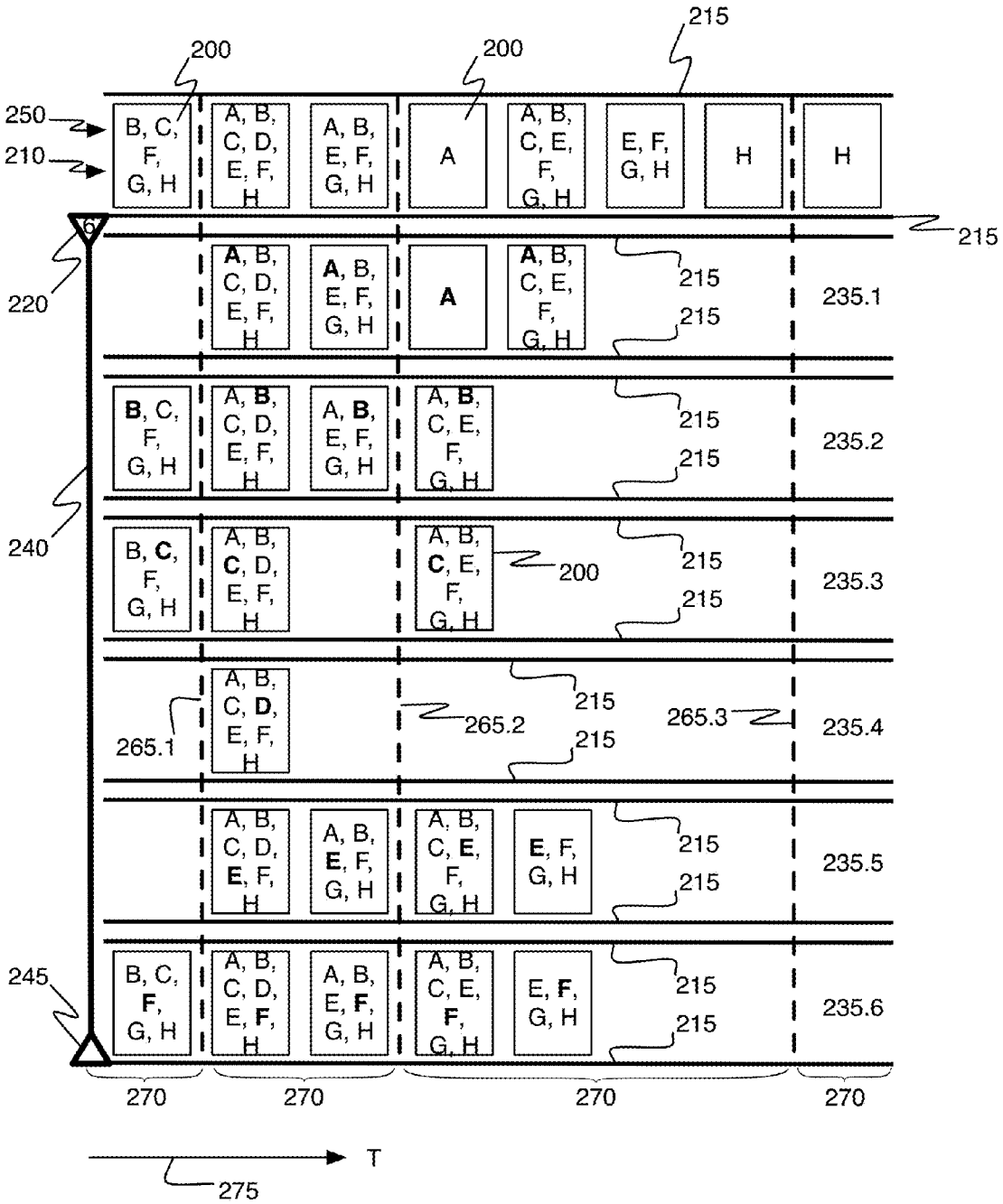
Fig.7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E, F, G, H
215
215
235.6
270
270
270
270
T
275

Fig.8

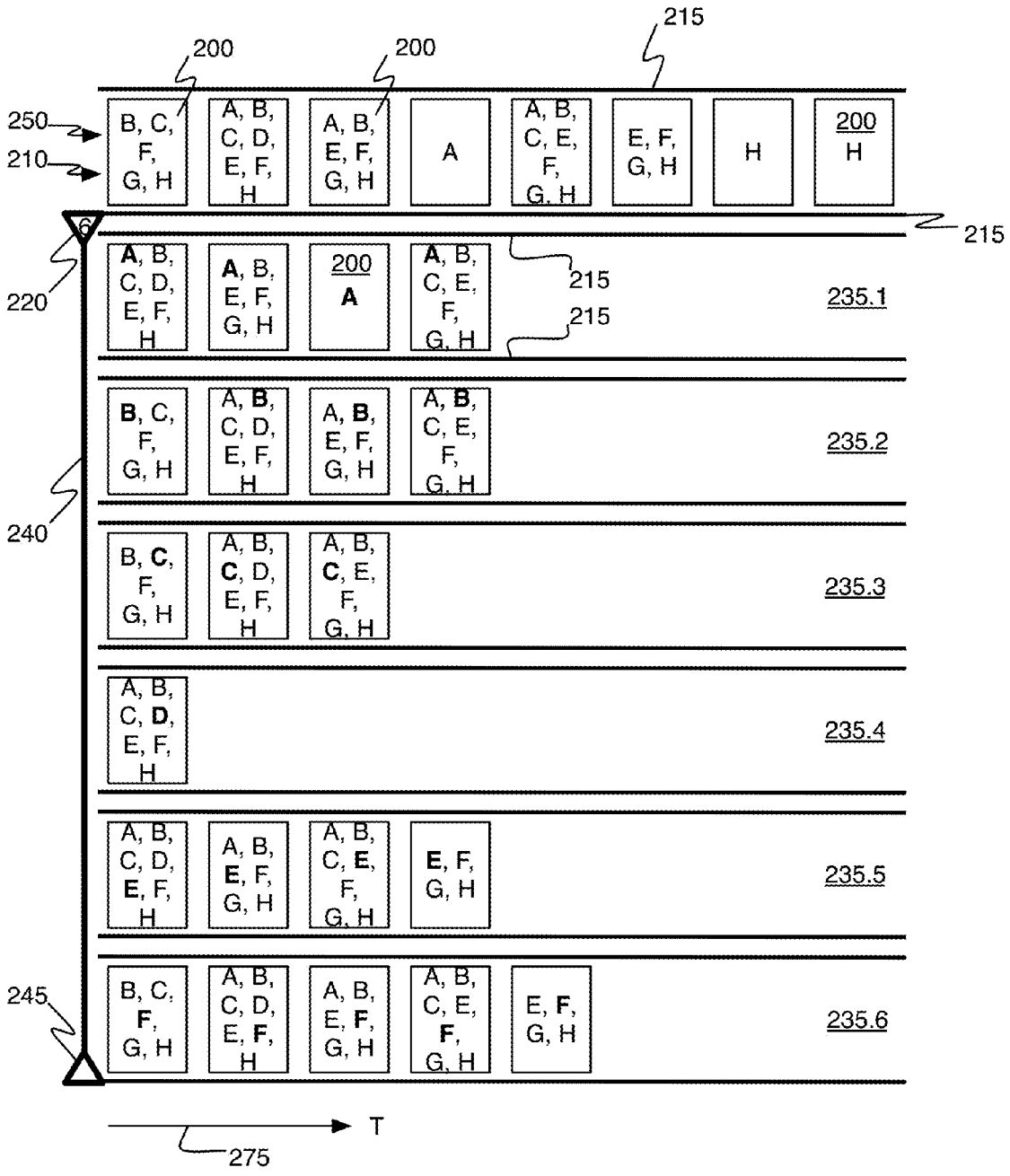

200
200
215
250
210
B, C, F, G, H
A, B, C, D, E, F, H
A, B, E, F, G, H
A
A, B, C, E, F, G, H
E, F, G, H
H
200 H
215
220
A, B, C, D, E, F, H
A, B, E, F, G, H
200 A
A, B, C, E, F, G, H
215
215
235.1
B, C, F, G, H
A, B, C, D, E, F, H
A, B, E, F, G, H
A, B, C, E, F, G, H
235.2
240
B, C, F, G, H
A, B, C, D, E, F, H
A, B, C, E, F, G, H
235.3
A, B, C, D, E, F, H
235.4
A, B, C, D, E, F, H
A, B, E, F, G, H
A, B, C, E, F, G, H
E, F, G, H
235.5
245
B, C, F, G, H
A, B, C, D, E, F, H
A, B, E, F, G, H
A, B, C, E, F, G, H
E, F, G, H
235.6
T
275

Fig.9

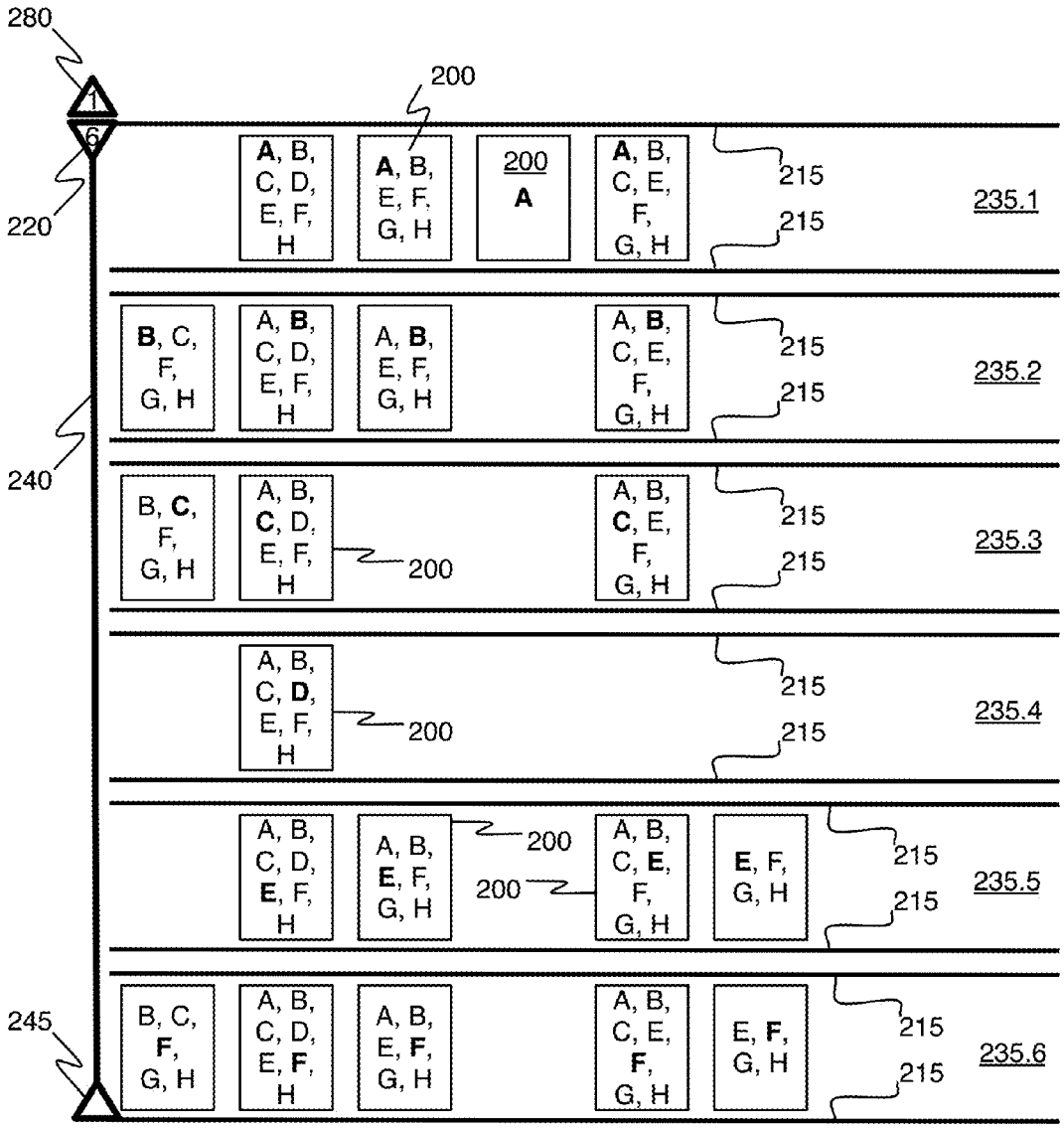

280
1
6
220
240
245
200
A, B, C, D, E, F, H
A, B, E, F, G, H
200 A
A, B, C, E, F, G, H
215
215
235.1
B, C, F, G, H
A, B, C, D, E, F, H
A, B, E, F, G, H
A, B, C, E, F, G, H
215
215
235.2
B, C, F, G, H
A, B, C, D, E, F, H
200
A, B, C, E, F, G, H
215
215
235.3
A, B, C, D, E, F, H
200
215
215
235.4
A, B, C, D, E, F, H
A, B, E, F, G, H
200
200
A, B, C, E, F, G, H
E, F, G, H
215
215
235.5
B, C, F, G, H
A, B, C, D, E, F, H
A, B, E, F, G, H
A, B, C, E, F, G, H
E, F, G, H
215
215
235.6

Fig.10

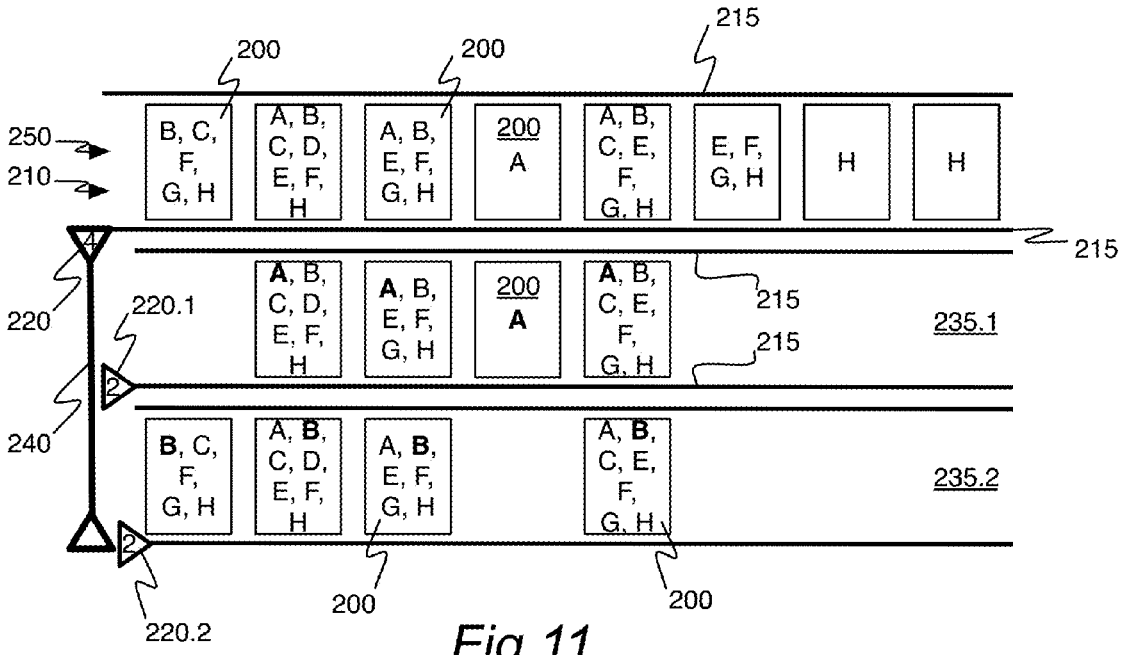

215
200
200
250
210
B, C, F, G, H
A, B, C, D, E, F, H
A, B, E, F, G, H
200 A
A, B, C, E, F, G, H
E, F, G, H
H
H
215
215
215
220
220.1
A, B, C, D, E, F, H
A, B, E, F, G, H
200 A
A, B, C, E, F, G, H
235.1
240
B, C, F, G, H
A, B, C, D, E, F, H
A, B, E, F, G, H
A, B, C, E, F, G, H
235.2
220.2
200
200

Fig.11

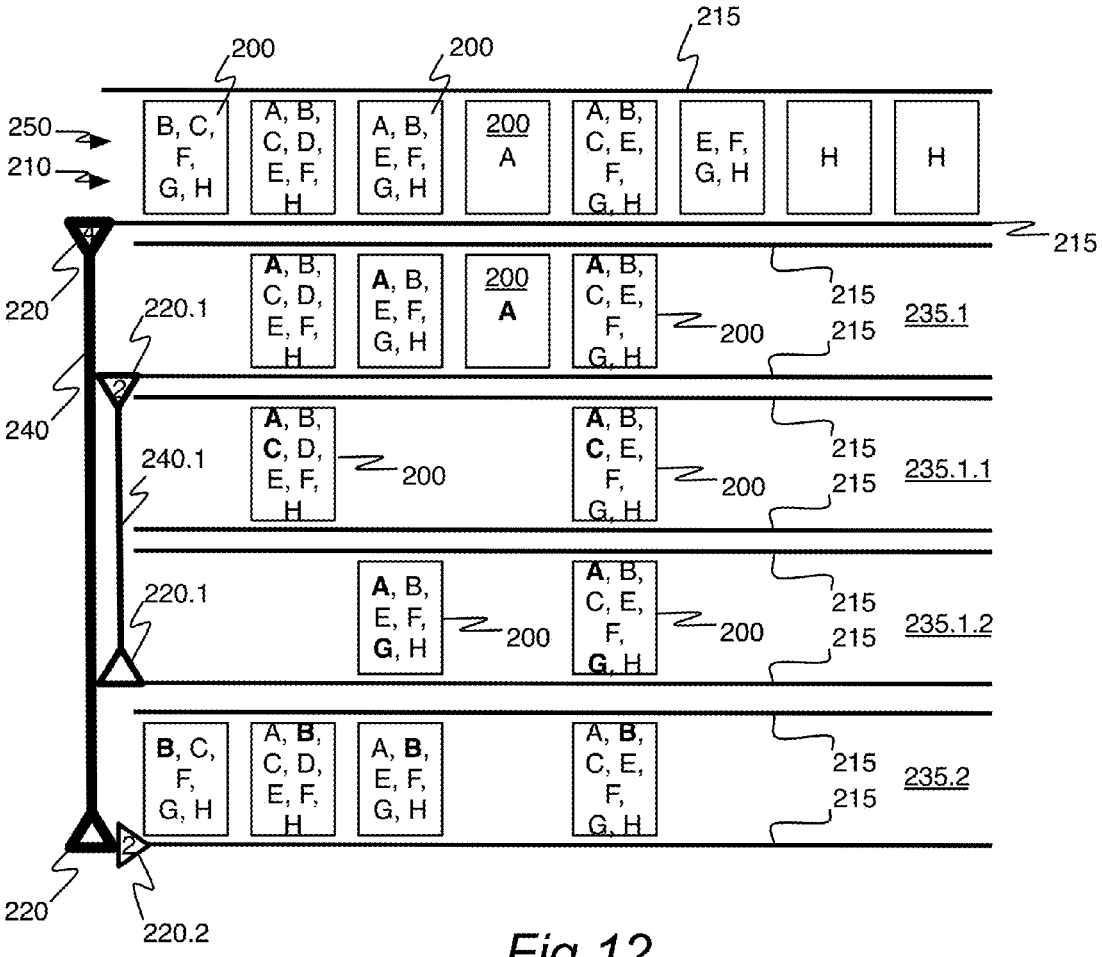

215
200
200
250
210
B, C, F, G, H
A, B, C, D, E, F, H
A, B, E, F, G, H
200 A
A, B, C, E, F, G, H
E, F, G, H
H
H
215
220
220.1
A, B, C, D, E, F, H
A, B, E, F, G, H
200 A
A, B, C, E, F, G, H
200
215
215
235.1
240
240.1
A, B, C, D, E, F, H
200
A, B, C, E, F, G, H
200
215
215
235.1.1
220.1
A, B, E, F, G, H
200
A, B, C, E, F, G, H
200
215
215
235.1.2
B, C, F, G, H
A, B, C, D, E, F, H
A, B, E, F, G, H
A, B, C, E, F, G, H
215
215
235.2
220
220.2

Fig.12

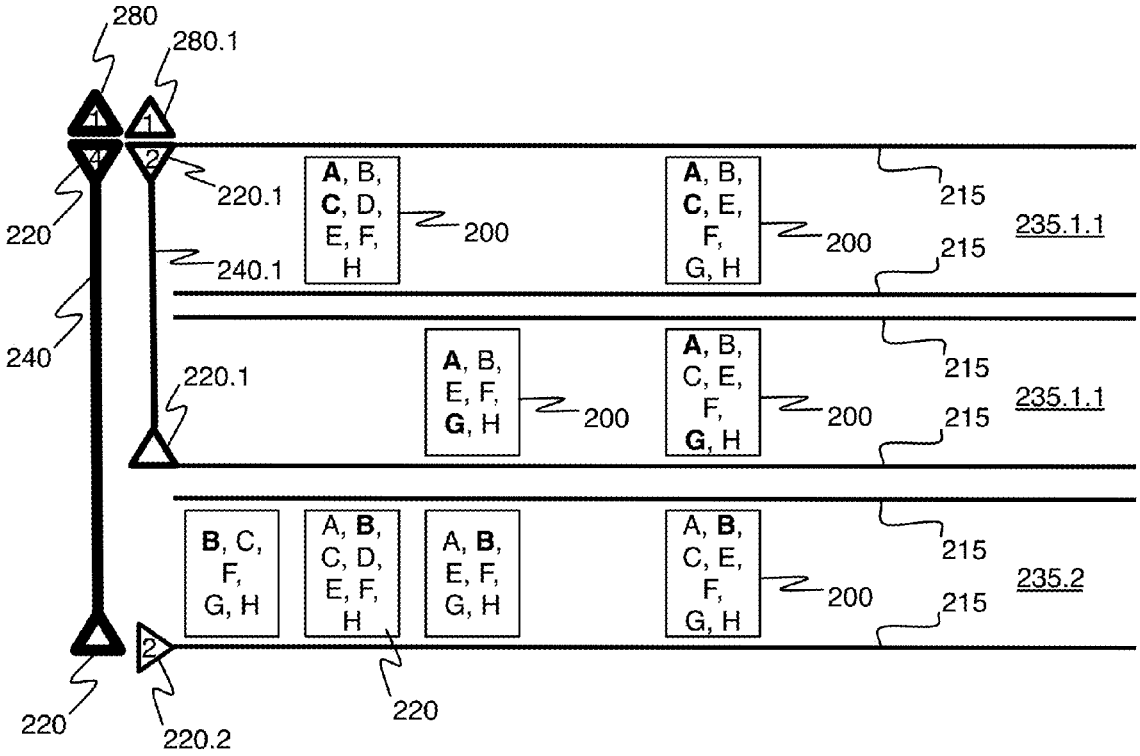

280
280.1
1
1
4
2
220
220.1
240.1
240
220.1
220
220.2
A, B, C, D, E, F, H
200
A, B, C, E, F, G, H
200
215
215
235.1.1
A, B, E, F, G, H
200
A, B, C, E, F, G, H
200
215
215
235.1.1
B, C, F, G, H
A, B, C, D, E, F, H
A, B, E, F, G, H
220
A, B, C, E, F, G, H
200
215
215
235.2

Fig.13

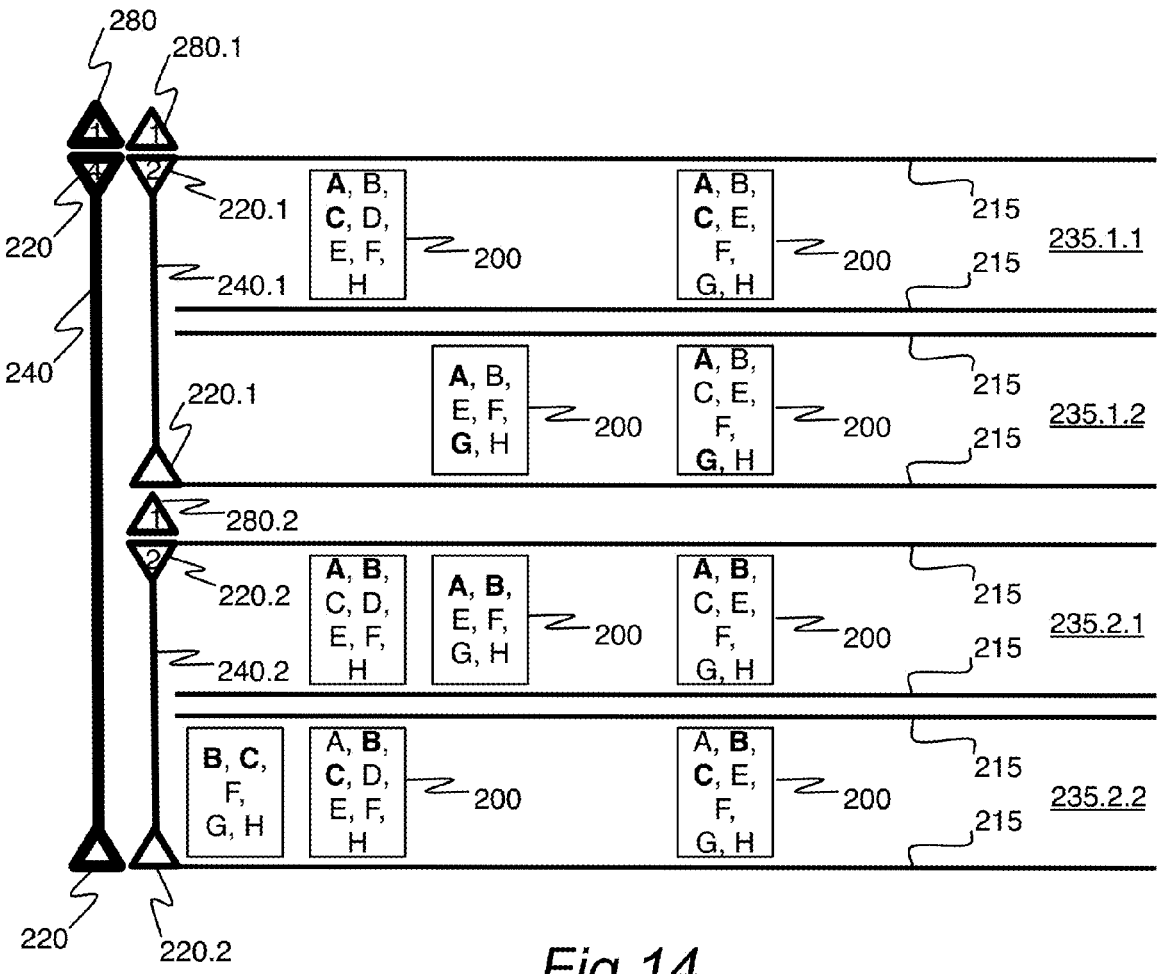

280
280.1
220
220.1
240.1
240
220.1
280.2
220.2
240.2
220
220.2
A, B, C, D, E, F, H
200
A, B, C, E, F, G, H
200
215
215
235.1.1
A, B, E, F, G, H
200
A, B, C, E, F, G, H
200
215
215
235.1.2
A, B, C, D, E, F, H
A, B, E, F, G, H
200
A, B, C, E, F, G, H
200
215
215
235.2.1
B, C, F, G, H
A, B, C, D, E, F, H
200
A, B, C, E, F, G, H
200
215
215
235.2.2

Fig.14

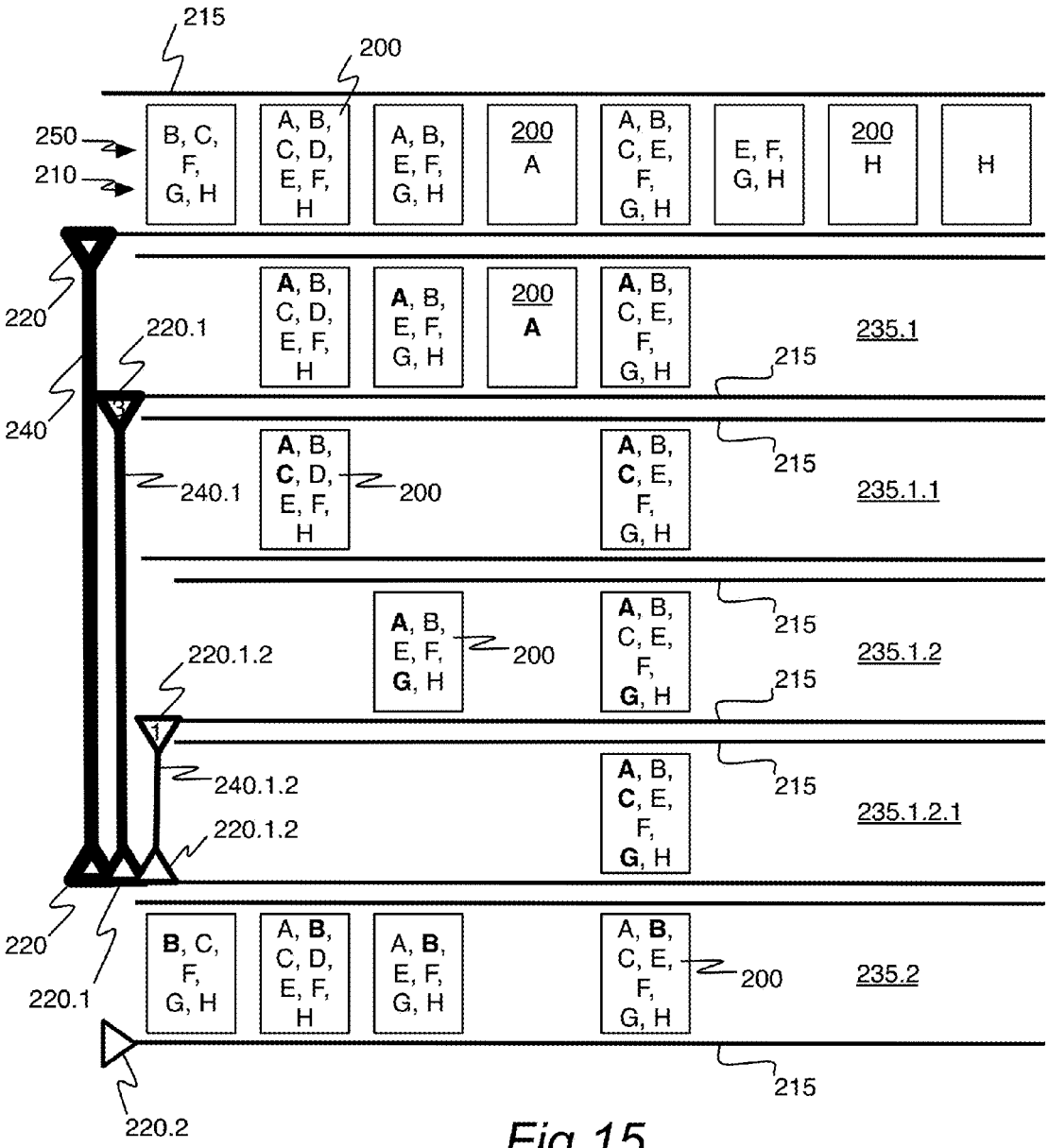

215
200
250
210
B, C, F, G, H
A, B, C, D, E, F, H
A, B, E, F, G, H
200 A
A, B, C, E, F, G, H
E, F, G, H
200 H
H
220
220.1
240
240.1
A, B, C, D, E, F, H
200
A, B, E, F, G, H
200 A
A, B, C, E, F, G, H
235.1
215
235.1.1
A, B, E, F, G, H
220.1.2
240.1.2
235.1.2
235.1.2.1
B, C, F, G, H
235.2
220.2

Fig.15

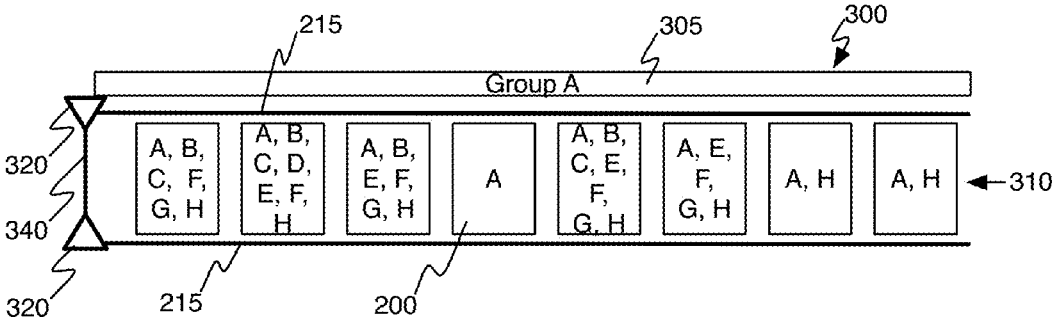


Fig.16

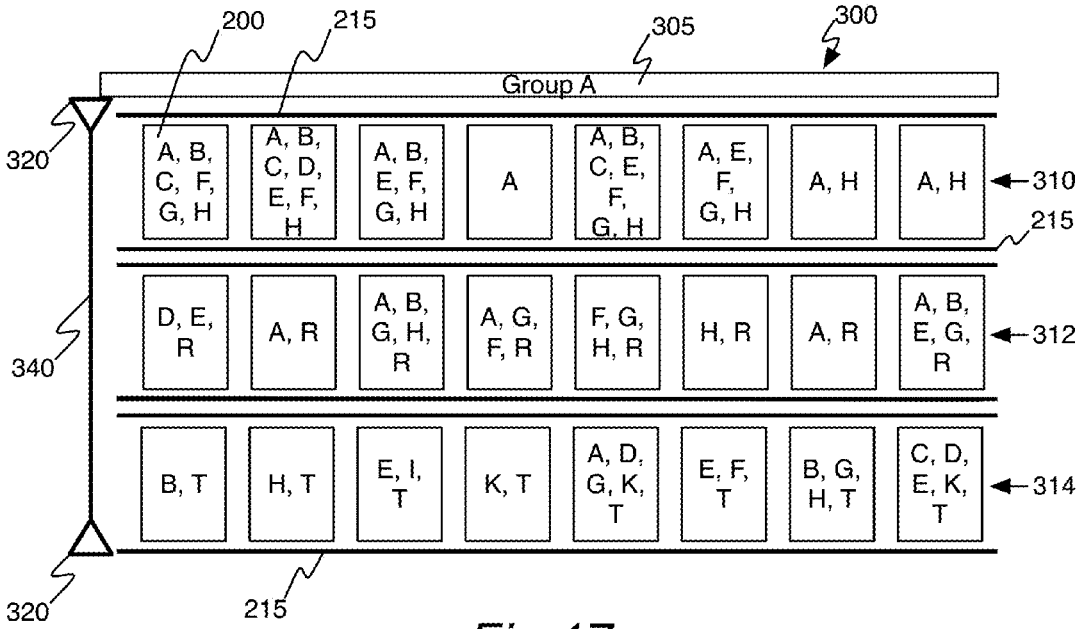


Fig.17

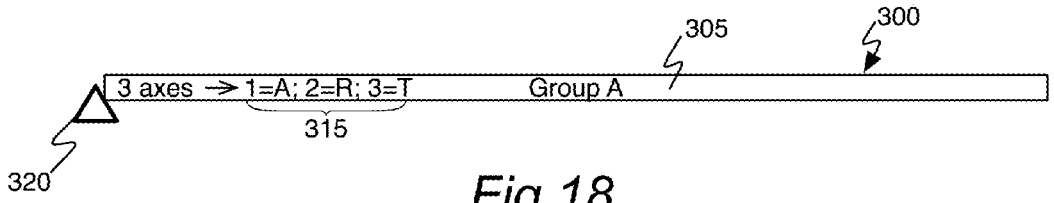


Fig.18

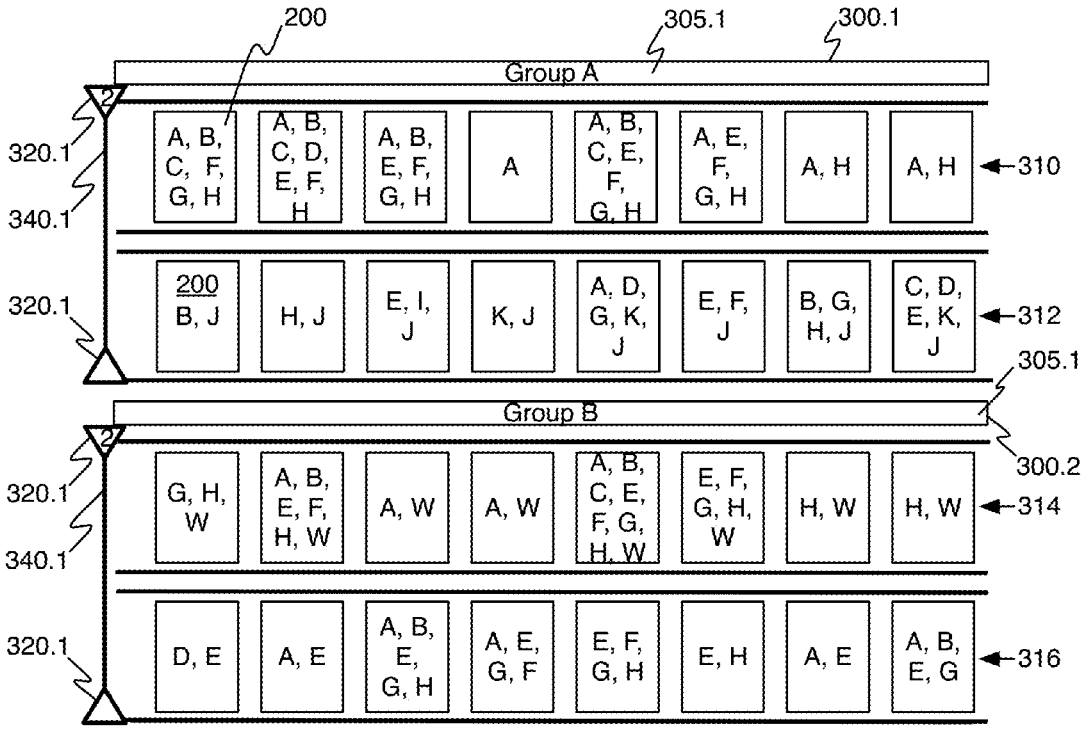

200
305.1
300.1
Group A
320.1
340.1
A, B, C, F, G, H
A, B, C, D, E, F, H
A, B, E, F, G, H
A
A, B, C, E, F, G, H
A, E, F, G, H
A, H
A, H
310
200 B, J
H, J
E, I, J
K, J
A, D, G, K, J
E, F, J
B, G, H, J
C, D, E, K, J
312
305.1
Group B
300.2
G, H, W
A, B, E, F, H, W
A, W
A, W
A, B, C, E, F, G, H, W
E, F, G, H, W
H, W
H, W
314
D, E
A, E
A, B, E, G, H
A, E, G, F
E, F, G, H
E, H
A, E
A, B, E, G
316

Fig.19

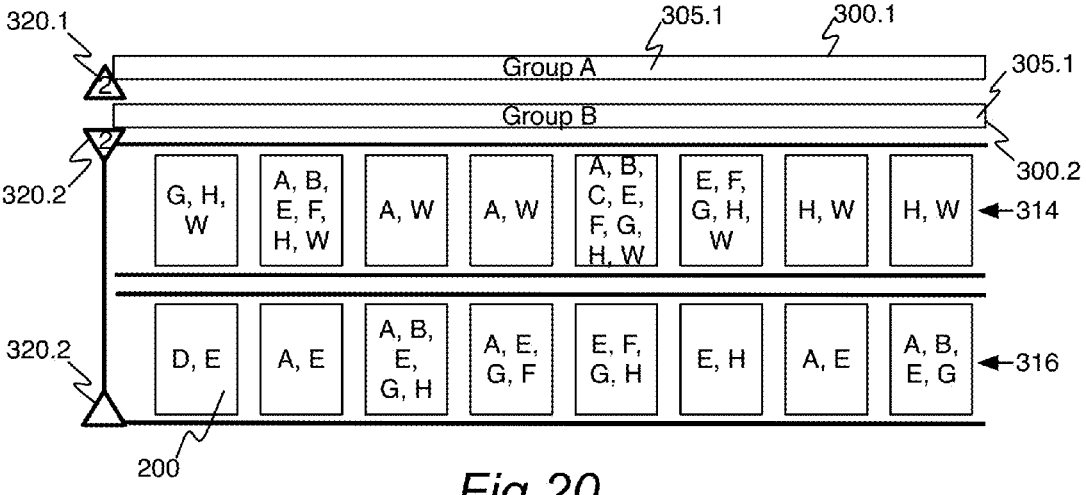

320.1
305.1
300.1
Group A
305.1
Group B
320.2
300.2
G, H, W
A, B, E, F, H, W
A, W
A, W
A, B, C, E, F, G, H, W
E, F, G, H, W
H, W
H, W
314
320.2
D, E
A, E
A, B, E, G, H
A, E, G, F
E, F, G, H
E, H
A, E
A, B, E, G
316
200

Fig.20

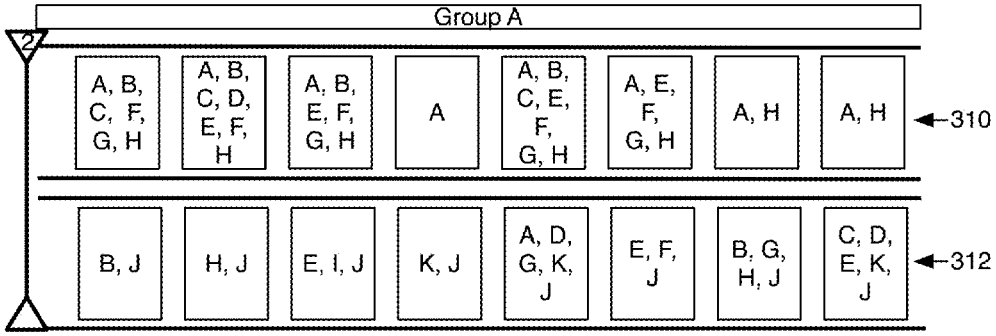


Fig.21

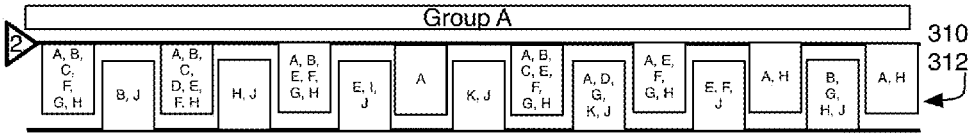


Fig.22

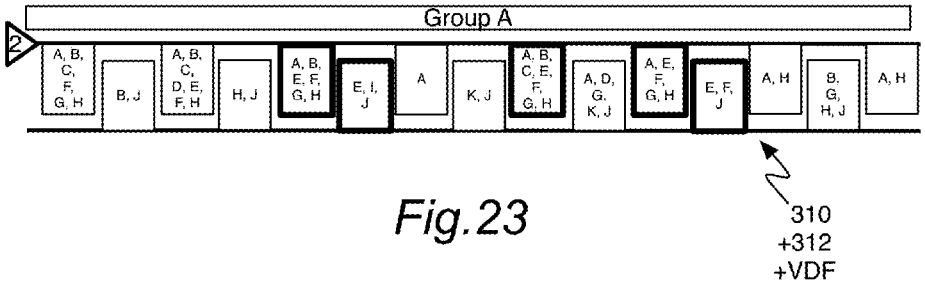


Fig.23

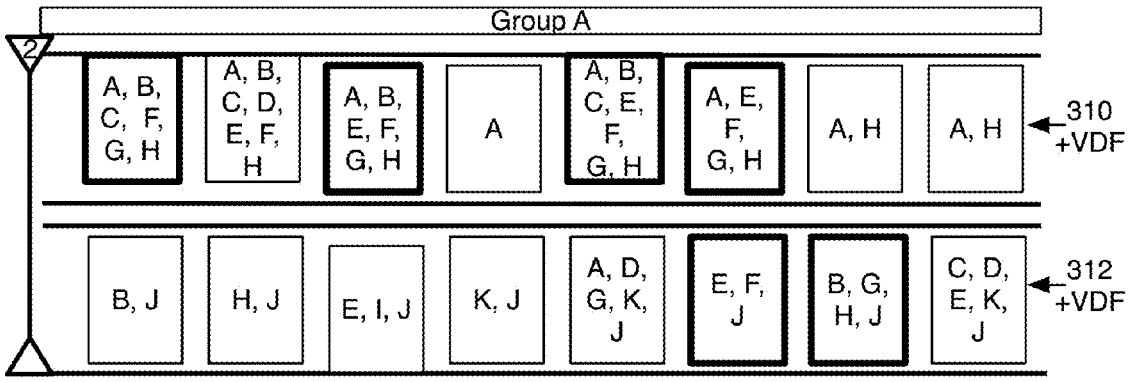

Group A
2
A, B, C, F, G, H
A, B, C, D, E, F, H
A, B, E, F, G, H
A
A, B, C, E, F, G, H
A, E, F, G, H
A, H
A, H
310 +VDF
B, J
H, J
E, I, J
K, J
A, D, G, K, J
E, F, J
B, G, H, J
C, D, E, K, J
312 +VDF

Fig.24

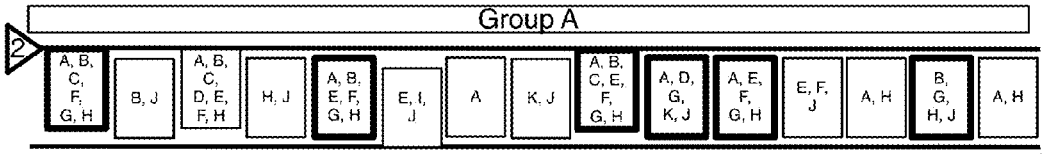

Group A
2
A, B, C, F, G, H
B, J
A, B, C, D, E, F, H
H, J
A, B, E, F, G, H
E, I, J
A
K, J
A, B, C, E, F, G, H
A, D, G, K, J
A, E, F, G, H
E, F, J
A, H
B, G, H, J
A, H

Fig.25

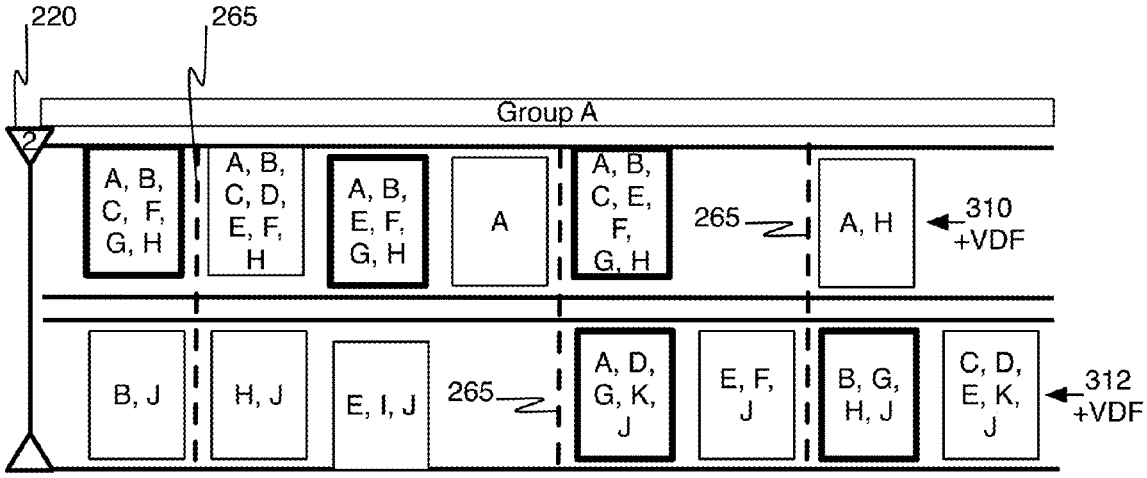

220
265
Group A
2
A, B, C, F, G, H
A, B, C, D, E, F, H
A, B, E, F, G, H
A
A, B, C, E, F, G, H
265
A, H
310
+VDF
B, J
H, J
E, I, J
265
A, D, G, K, J
E, F, J
B, G, H, J
C, D, E, K, J
312
+VDF

Fig.26

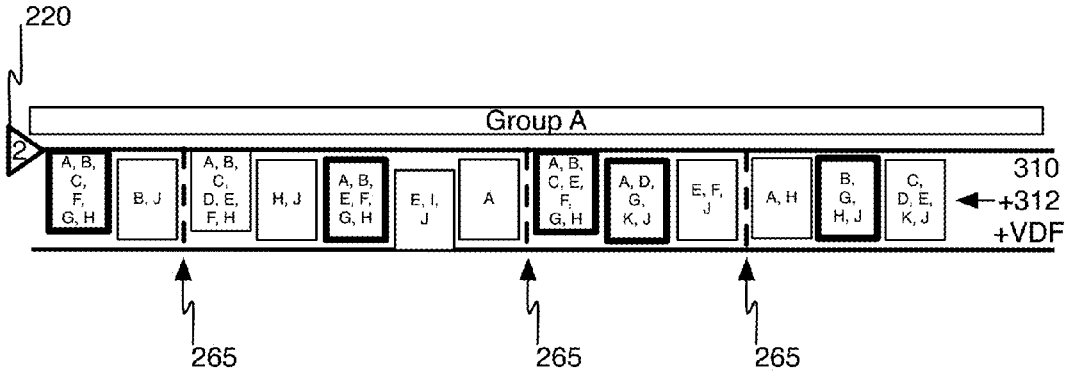

220
Group A
2
A, B, C, F, G, H
B, J
A, B, C, D, E, F, H
H, J
A, B, E, F, G, H
E, I, J
A
A, B, C, E, F, G, H
A, D, G, K, J
E, F, J
A, H
B, G, H, J
C, D, E, K, J
310
+312
+VDF
265
265
265

Fig.27

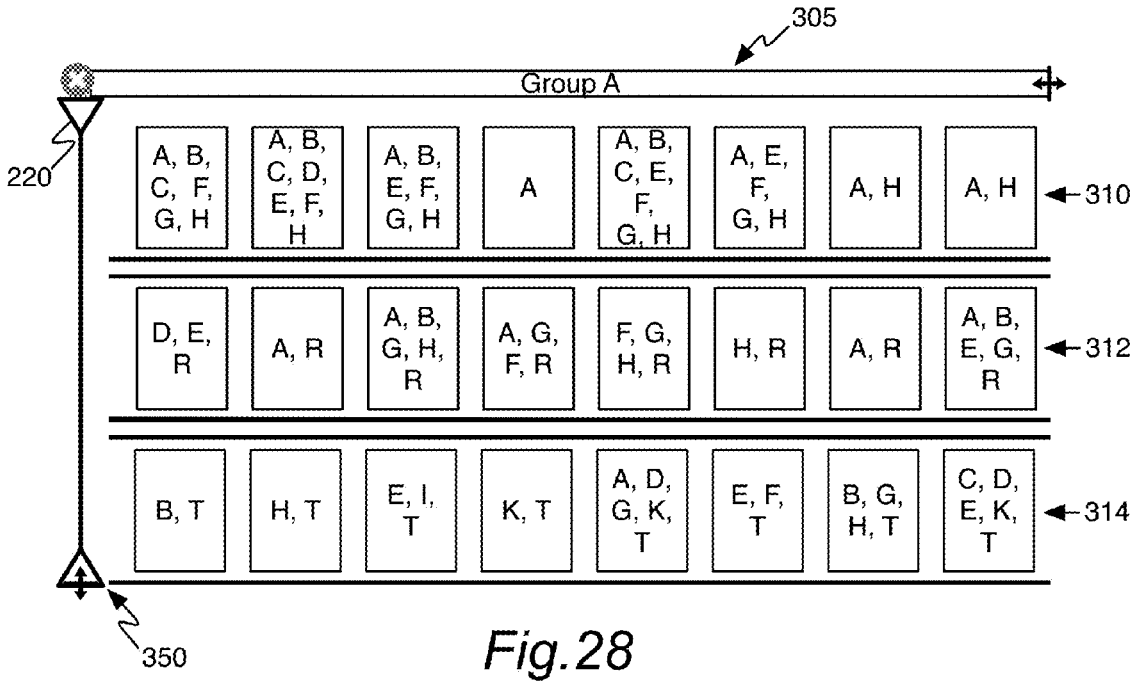


Fig.28

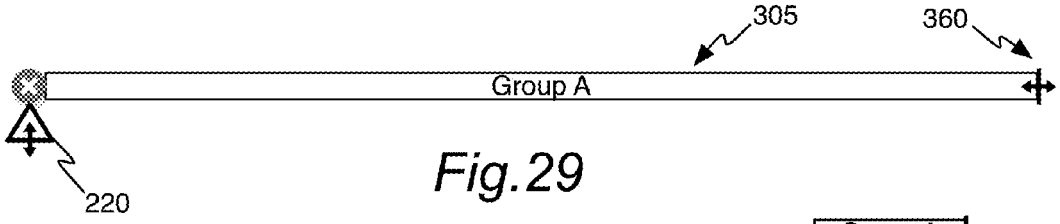


Fig.29

Fig.30

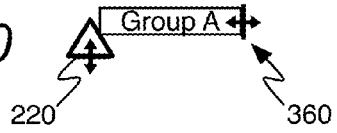


Fig.31

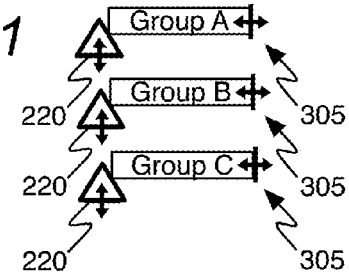
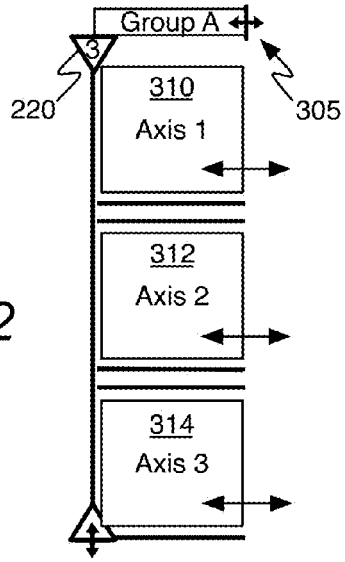


Fig.32



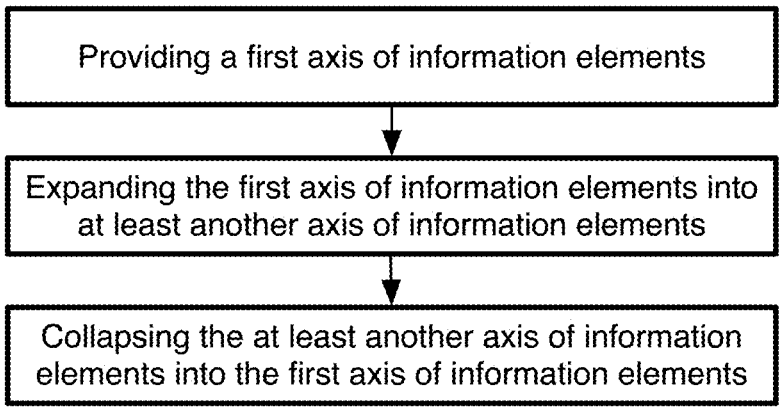

Providing a first axis of information elements
Expanding the first axis of information elements into at least another axis of information elements
Collapsing the at least another axis of information elements into the first axis of information elements

Fig. 33

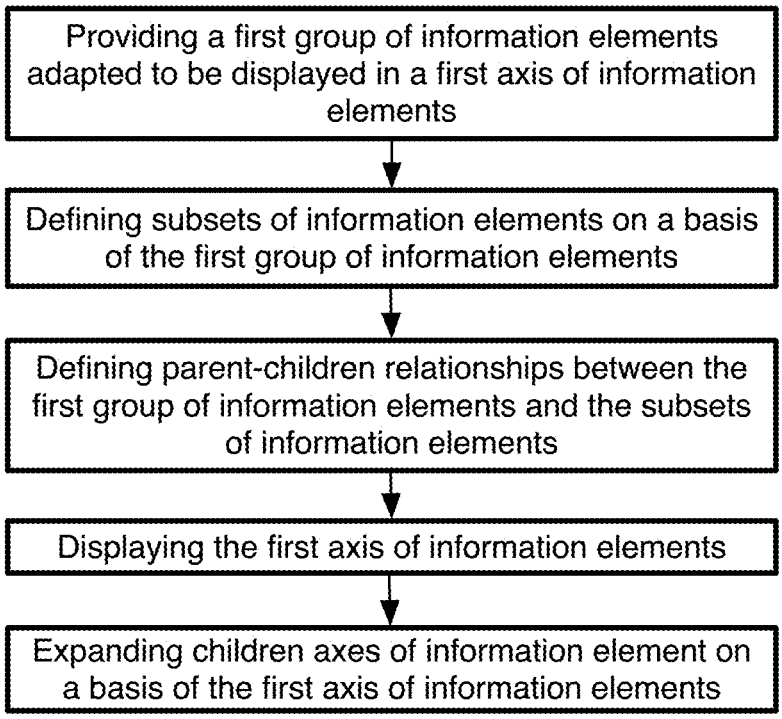

Providing a first group of information elements adapted to be displayed in a first axis of information elements
Defining subsets of information elements on a basis of the first group of information elements
Defining parent-children relationships between the first group of information elements and the subsets of information elements
Displaying the first axis of information elements
Expanding children axes of information element on a basis of the first axis of information elements

Fig. 34

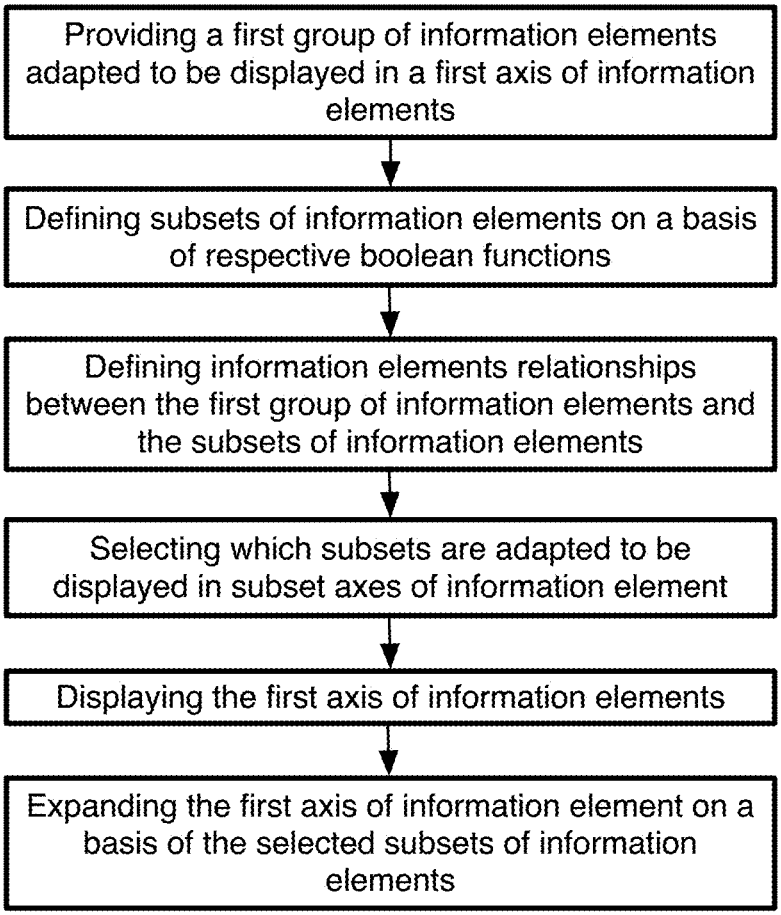

Providing a first group of information elements adapted to be displayed in a first axis of information elements
Defining subsets of information elements on a basis of respective boolean functions
Defining information elements relationships between the first group of information elements and the subsets of information elements
Selecting which subsets are adapted to be displayed in subset axes of information element
Displaying the first axis of information elements
Expanding the first axis of information element on a basis of the selected subsets of information elements

Fig. 35

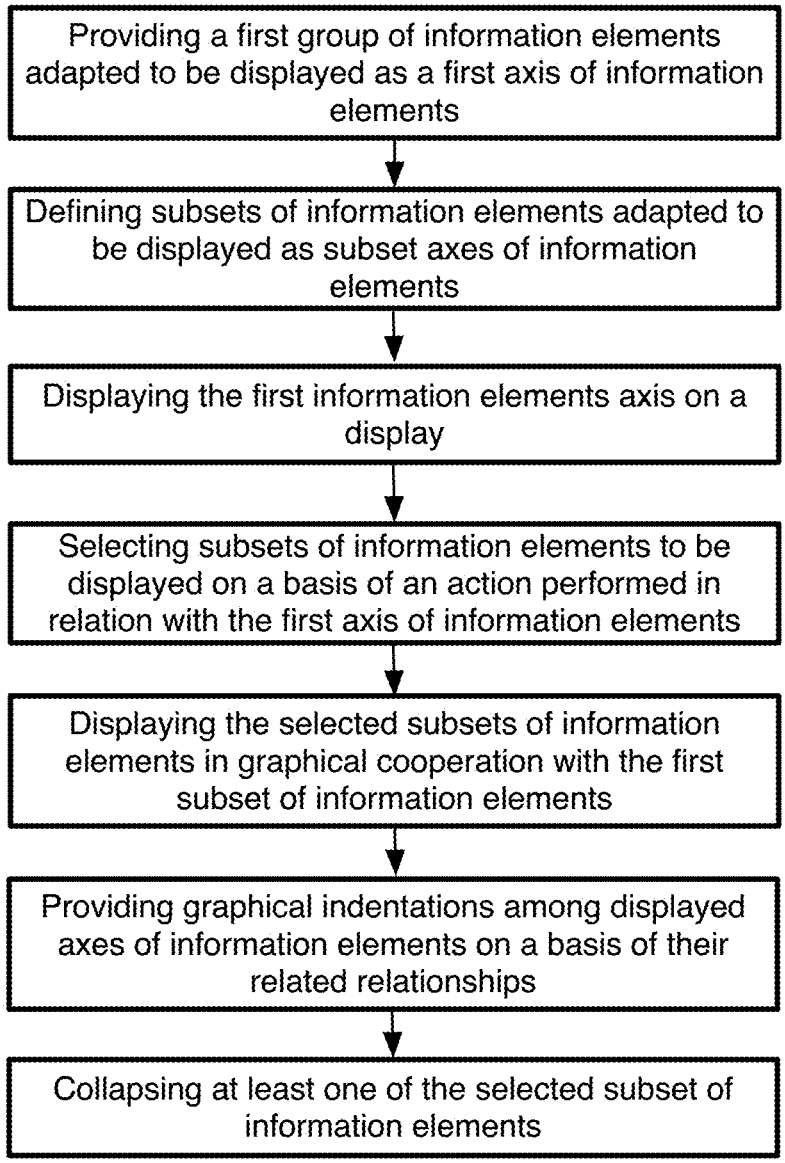

Providing a first group of information elements adapted to be displayed as a first axis of information elements
Defining subsets of information elements adapted to be displayed as subset axes of information elements
Displaying the first information elements axis on a display
Selecting subsets of information elements to be displayed on a basis of an action performed in relation with the first axis of information elements
Displaying the selected subsets of information elements in graphical cooperation with the first subset of information elements
Providing graphical indentations among displayed axes of information elements on a basis of their related relationships
Collapsing at least one of the selected subset of information elements

Fig. 36

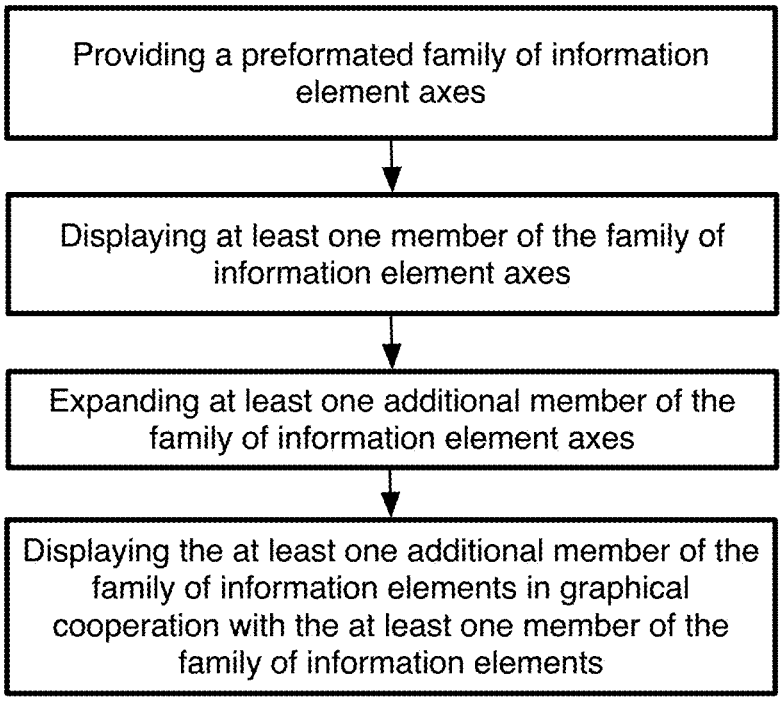

Providing a preformated family of information element axes
Displaying at least one member of the family of information element axes
Expanding at least one additional member of the family of information element axes
Displaying the at least one additional member of the family of information elements in graphical cooperation with the at least one member of the family of information elements

Fig. 37

EXPANDABLE AND COLLAPSIBLE ARRAYS OF DOCUMENTS

CROSS-REFERENCES

The present invention relates to and claims priority from U.S. Provisional patent application No. 61/438,609, filed on Feb. 1, 2011, entitled ACTIVE AND SELECTED DOCUMENTS ON ARRAYS THEREOF; EXPANDABLE AND COLLAPSIBLE ARRAYS OF DOCUMENTS; NON-HOMOGENEOUS OBJECTS MAGNIFICATION AND REDUCTION, which is incorporated herein by reference.

FIELD OF THE INVENTION

This invention relates generally to computer systems and more specifically to a method, a system and an interface that facilitates localization, organization and use of information elements and user-selectable elements. More precisely, the present invention relates to a method of selecting and identifying information elements.

BACKGROUND OF THE INVENTION

With the always-increasing amount of documents one has to deal with on a daily basis it becomes harder to manage the documents (or information or file) on an item-by-item basis. An alternative document management system adapted to organize large amount of information would be beneficial to the user.

United States Patent Application Publication No.: US 2007/0214169 A1, published on Sep. 13, 2007, which is incorporated herein by reference, discloses a multi-dimensional locating system and method (title). The patent application provides embodiments for managing and displaying axes of documents and other computer-readable files. An axis of documents grouping a plurality of documents along a predetermined order, inter alia, is taught.

The use of an axis of documents brings some specific behavior as oppose to document presentation mechanism in the art. One of the specific of an axis is that one might want to navigate thereon while making selections of documents and seeing a magnified version of a document.

The use of a small number of axes of information elements on a display might result in a non-optimal use of the usable display area. A larger number of axes might be desirable to provide more information to a viewer. A number of challenges need to be addressed in order to provide functions performed on a larger quantity of documents. For instance, axes of documents can take significant space on a display and some cases of use can require displaying a plurality of axes simultaneously on a display. This might clutter the display area while it might not be required to completely see all the axes all the time on the display area.

Also, an axis of information elements can group a plurality of information elements having a commonality. The discrimination of information elements required to be displayed on the axis might change depending of the task to be made. Some tasks might require a more detailed distribution of information elements while some other tasks might require fewer details associated with the same information elements. In some cases significant details are required for a time period and the level of details can be reduced for the remaining time while the information elements remain available for further inquiry or filtering.

In view of the prior art it appears that improvements over the prior art is desirable to improve the user experience and usability either with innovative graphical, structural or functional improvements.

SUMMARY OF THE INVENTION

The following presents a simplified summary of the invention in order to provide a basic understanding of some aspects of the invention. This summary is not an extensive overview of the invention. It is not intended to identify key/critical elements of the invention or to delineate the scope of the invention. Its sole purpose is to present some concepts of the invention in a simplified form as a prelude to the more detailed description that is presented later.

This invention generally refers to user-selectable elements that might represent computer-readable files like documents and multimedia assets. Information elements can alternatively be referred to as, user-selectable elements, menu icons or thumbnails that are associated to an attribute, a category or a tag and arranged as explained below. In order to lighten the reading of the present specification, the term "document" is generally used without intending to limit the scope of the present patent application only to documents, unless expressly specified.

Also, the invention is generally described using an assembly of documents called an array of documents. The array of documents generally refers to, but is not limited to, a comprehensive graphical layout of documents. Hereinbelow referred to as an axis that is a substantially rectilinear arrangement of documents. The axis might not necessarily be straight but preferably has a consistent shape providing a viewer en indication of continuity therebetween documents disposed thereon. In other words, the array of documents can be defined by a single axis or a double axis of documents (or more adjacent axes of documents) and the axis can be completely straight, slightly curved, substantially curved, angled, following a particular shape or having a consistent shape over which documents are disposed in a reasonably consistent fashion adapted to allow a viewer to infer a comprehensive suite of documents. The axes presented in the embodiments below are illustrated in the horizontal position while they could be disposed vertically without departing from the scope of the present disclosure.

An embodiment referred to below provides one or more groups of axes comprising documents thereon. Each axis of documents is preferably rectilinear to easily be located adjacent with other axes of documents to efficiently use the useful display area of the display. A system adapted to carry on the embodiments, a user graphical interface adapted to display the embodiments, a method adapted to provides the steps required to enable the embodiments and a medium storing instructions enabling the method once read by a machine are all considered within the scope of the present invention.

Therefore, an embodiment of the present invention provides an expandable axis of documents displaying one axis of documents in its contracted configuration and a larger number of axes of documents in its expanded configuration.

One embodiment of the present invention provides a mechanism adapted to operatively link a parent axis of documents to children axis of documents.

An embodiment of the present invention provides a mechanism adapted to operatively link a plurality of levels of parent—children axes of documents.

Another embodiment of the present invention provides a mechanism adapted to provide several levels of parent—children axes of documents under the same "grand-parent" axis of documents.

One other embodiment of the present invention provides a group of axes of documents, the group of axes of documents being collapsible to reduce the used area on a display.

An embodiment of the present invention provides children axes of documents that are subsets of the documents found in the parent axis of documents.

Another embodiment of the present invention provides a mechanism adapted to visually discriminate expandable axes of documents.

One other embodiment of the present invention provides a mechanism adapted to visually discriminate expanded axes of documents preferably in relation with their parent axis of documents.

One embodiment of the present invention provides a mechanism adapted to collapse or hide the parent array of documents when children axes of documents thereof are expanded.

One other embodiment of the present invention provides a longitudinal indentation to children axes of documents in respect with their parent axis of documents.

Another embodiment of the present invention provides a means to preset and manage children axes of documents for a parent array of documents.

One embodiment of the present invention provides a mechanism adapted to discriminate attribute(s) used to define the query of the children axes of documents to inform the user of which documents are to be found in each children axis of documents.

Another embodiment of the present invention provides a method of expanding and/or contracting a parent axis of documents by using keys on a keyboard; by pointing a mouse or another pointing device on a display; and touching a display with a finger (or hovered with a user-managed pointer or with a human body part contacting a touch-screen).

One embodiment of the present invention provides animations when a parent axis of documents is expanding its children axes of documents and/or when the children axes of documents are collapsed.

One additional embodiment of the present invention provides a mechanism capable of magnifying one or many axes of documents in a group of parent-children axes of documents.

Another embodiment of the present invention provides a multi-level of children axes of documents that, when expanded under a parent axis, are graphically discriminated such that one can easily appreciate the various children axes levels.

One embodiment of the present invention provides a mechanism adapted to allow adding or removing a children axis of documents once expanded under its parent axis.

Another embodiment of the present invention provides a mechanism adapted to collapse a parent axis of document independently from its children axes of documents.

One other embodiment of the present invention provides a collapse of a parent axis with its children axes on a display to minimize the space required by the axes while providing a mechanism to expand the collapsed axes of documents when required. A parent header or a thumbnail is adapted to remain on the display to allow rapid expansion of the axes when required.

Another embodiment of the present invention provides a horizontal collapsing of the axes while another embodiment provides a vertical collapsing of the axes. One other embodiment provides a combined vertical and horizontal collapsing of the axes.

Another embodiment of the present invention provides a product comprising a machine-readable medium and machine-executable instructions for causing a computer to perform a method comprising providing a first array of information elements adapted to be expanded into at least one other array of information elements on a display.

Another embodiment of the present invention provides a method of displaying information elements on a display of a computer system with arrays of information elements, the method comprising displaying a first array of information elements, expanding the first array of information elements into at least one other array of information elements, wherein the first array of information elements and the at least one other array of information elements have a commonality.

A computer implemented method of managing display area on a display of a computer system, the method comprising providing a plurality of axes of information elements, displaying at least one of the plurality of axes, and providing instructions to expand the displayed at least one of the plurality of axes into at least one other axis of information elements.

Other advantages might become apparent to the skilled reader of this patent specification in light of the appended drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a schematic illustration of an exemplary computer network;

FIG. **2** is a schematic illustration of an exemplary multi-devices network layout;

FIG. **3** is a schematic illustration of a typical exemplary computer system;

FIG. **4** is a schematic illustration of an array of documents in accordance with an exemplary embodiment of the present invention;

FIG. **5** is a schematic illustration of an expandable array of documents in accordance with an exemplary embodiment of the present invention;

FIG. **6** is a schematic illustration of an expanded array of documents in accordance with an exemplary embodiment of the present invention;

FIG. **7** is a schematic illustration of an expanded array of documents in accordance with an exemplary embodiment of the present invention;

FIG. **8** is a schematic illustration of an expanded array of documents in accordance with an exemplary embodiment of the present invention;

FIG. **9** is a schematic illustration of an expanded array of documents in accordance with an exemplary embodiment of the present invention;

FIG. **10** is a schematic illustration of an expanded array of documents in accordance with an exemplary embodiment of the present invention;

FIG. **11** is a schematic illustration of an expanded array of documents having two levels of expansion in accordance with an exemplary embodiment of the present invention;

FIG. **12** is a schematic illustration of an expanded array of documents having two levels of expansion in accordance with an exemplary embodiment of the present invention;

FIG. **13** is a schematic illustration of an expanded array of documents having two levels of expansion in accordance with an exemplary embodiment of the present invention;

FIG. **14** is a schematic illustration of an expanded array of documents having two levels of expansion in accordance with an exemplary embodiment of the present invention;

FIG. **15** is a schematic illustration of an expanded array of documents having three levels of expansion in accordance with an exemplary embodiment of the present invention;

FIG. **16** is a schematic illustration of an expanded group of documents in accordance with an exemplary embodiment of the present invention;

FIG. **17** is a schematic illustration of an expanded group of documents in accordance with an exemplary embodiment of the present invention;

FIG. **18** is a schematic illustration of a collapsed group of documents in accordance with an exemplary embodiment of the present invention;

FIG. **19** is a schematic illustration of two expanded groups of documents in accordance with an exemplary embodiment of the present invention;

FIG. **20** is a schematic illustration of a collapsed group of documents and an expanded group of documents in accordance with an exemplary embodiment of the present invention;

FIG. **21** is a schematic illustration of an expanded group of documents in accordance with an exemplary embodiment of the present invention;

FIG. **22** is a schematic illustration of a contracted axis of documents having visual distinctive features thereon in accordance with an exemplary embodiment of the present invention;

FIG. **23** is a schematic illustration of a contracted axis of documents having visual distinctive features thereon in accordance with an exemplary embodiment of the present invention;

FIG. **24** is a schematic illustration of an expanded group of documents having visual distinctive features thereon in accordance with an exemplary embodiment of the present invention;

FIG. **25** is a schematic illustration of a contracted axis of documents having visual distinctive features thereon in accordance with an exemplary embodiment of the present invention;

FIG. **26** is a schematic illustration of an expanded group of documents having visual distinctive features thereon in accordance with an exemplary embodiment of the present invention;

FIG. **27** is a schematic illustration of a contracted axis of documents having visual distinctive features thereon in accordance with an exemplary embodiment of the present invention;

FIG. **28** is a schematic illustration of an expanded group of documents having visual distinctive features thereon in accordance with an exemplary embodiment of the present invention;

FIG. **29** is a schematic illustration of a contracted group of documents in accordance with an exemplary embodiment of the present invention;

FIG. **30** is a schematic illustration of a contracted group of documents in accordance with an exemplary embodiment of the present invention;

FIG. **31** is a schematic illustration of a plurality of contracted groups of documents in accordance with an exemplary embodiment of the present invention;

FIG. **32** is a schematic illustration of a plurality of contracted groups of documents in accordance with an exemplary embodiment of the present invention;

FIG. **33** is a schematic illustrative flow chart of an exemplary embodiment of the present invention;

FIG. **34** is a schematic illustrative flow chart of an exemplary embodiment of the present invention;

FIG. **35** is a schematic illustrative flow chart of an exemplary embodiment of the present invention;

FIG. **36** is a schematic illustrative flow chart of an exemplary embodiment of the present invention;

FIG. **36** is a schematic illustrative flow chart of an exemplary embodiment of the present invention; and

FIG. **37** is a schematic illustrative flow chart of an exemplary embodiment of the present invention

DESCRIPTION OF EMBODIMENT(S) OF THE INVENTION

The present invention is now described with reference to the drawings, wherein like reference numerals are used to refer to like elements throughout. In the following description, for purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of the present invention. It may be evident, however, that the present invention may be practiced without these specific details. In other instances, well-known structures and devices are shown in block diagram form in order to facilitate describing the present invention.

The description is separated with subtitles to facilitate its readability. The subtitles include descriptions of portions of invention that might be interrelated despite they might appear under different subtitles. In other words, subtitles are not intended to separate part of the same invention or different inventions described therein but are rather intended to structure the text.

The features provided in this specification mainly relates to basic principles for managing arrays of documents. These code/instructions are preferably stored on a machine-readable medium adapted to be read and acted upon to with a computer or a machine having corresponding code/instructions reading capability.

Exemplary Network

FIG. **1** illustrates an exemplary network **10** in which a system and method, consistent with the present invention, may be implemented. The network **10** may include multiple client devices **12** connected to multiple servers **14**, **16**, **18** via a network **20**. The network **20** may include a local area network (LAN), a wide area network (WAN), a telephone network, such as the Public Switched Telephone Network (PSTN), an intranet, the Internet, Wi-Fi, WiMAX or a combination of networks. Two client devices **12** and three servers **14**, **16**, **18** have been illustrated as connected to network **20** for simplicity. In practice, there may be more or less client devices and servers. Also, in some instances, a client device may perform the functions of a server and a server may perform the functions of a client device.

The client devices **12** may include devices, such as mainframes, minicomputers, personal computers, laptops, personal digital assistants, telephones, or the like, capable of connecting to the network **20**. The client devices **12** may transmit data over the network **20** or receive data from the network **20** via a wired, wireless, or optical connection.

The servers **14**, **16**, **18** may include one or more types of computer systems, such as a mainframe, minicomputer, or personal computer, capable of connecting to the network **20** to enable servers **14**, **16**, **18** to communicate with the client devices **12**. In alternative implementations, the servers **14**, **16**, **18** may include mechanisms for directly connecting to one or more client devices **12**. The servers **14**, **16**, **18** may transmit data over network **14** or receive data from the network **20** via a wired, wireless, or optical connection.

In an implementation consistent with the present invention, the server **14** may include a search engine **22** usable by the client devices **12**. The servers **14** may store documents, such as web pages, accessible by the client devices **12**.

With reference to FIG. **2**, a network **20** includes the content cloud **30**, a content database **32**, content devices **34-38**, and devices **40-48**. The network mediator **28** enables the network devices **32-38** to communicate with each other without pre-configuring each device.

The content cloud **30** represent a content source such as the Internet, where content exists at various locations across the globe. The content includes multimedia content such as audio and video. The mediator **28** allows the content cloud to provide content to devices **40-48**.

The content database **32** is a storage device that maintains content. The content database **32** may be a stand-alone device on an external communication network. The mediator **28** communicates with the content database **32** to access and retrieve content.

The content devices **34-38** include intelligent devices, such as, for example, personal computers, laptops, cell phones and personal digital assistants. The content devices **32-38** are capable or storing content information.

The devices **40-48** are intelligent devices that receive content from a content source **30-38**. However, the devices **30-38** can also operate as servers to distribute content to other client devices.

Exemplary Client Architecture

FIG. **3** and the following discussion provide a brief, general description of an exemplary apparatus in which at least some aspects of the present invention may be implemented. The present invention will be described in the general context of computer-executable instructions, such as program modules, being executed by a personal computer. However, other apparatus may affect the methods of the present invention. Program modules may include routines, programs, objects, components, data structures, applets, WEB 2.0 type of evolved networked centered applications, etc. that perform a task(s) or implement particular abstract data types. Moreover, those skilled in the art will appreciate that at least some aspects of the present invention may be practiced with other configurations, including hand-held devices, multiprocessor systems, microprocessor-based or programmable consumer electronics, network computers, minicomputers, set top boxes, mainframe computers, gaming console and the like. At least some aspects of the present invention may also be practiced in distributed computing environments where tasks are performed by remote processing devices linked through a communications network. In a distributed computing environment, program modules may be located in local and/or remote memory storage devices.

Now, with reference to FIG. **3**, an exemplary apparatus **100** for implementing at least some aspects of the present invention includes a general-purpose computing device in the form of a conventional personal computer **120**. The personal computer **120** may include a processing unit **121**, a system memory **122**, and a system bus **123** that couples various system components, including the system memory **122**, to the processing unit **121**. The system bus **123** may be any of several types of bus structures including a memory bus or memory controller, a peripheral bus, and a local bus using any of a variety of bus architectures. The system memory may include read only memory (ROM) **124** and/or random access memory (RAM) **125**. A basic input/output system **126** (BIOS), containing basic routines that help to transfer information between elements within the personal computer **120**, such as during start-up, may be stored in ROM **124**. The personal computer **120** may also include a hard disk drive **127** for reading from and writing to a hard disk, (not shown), a magnetic disk drive **128** for reading from or writing to a (e.g., removable) magnetic disk **129**, and an optical disk drive **130** for reading from or writing to a removable (magneto) optical disk **131** such as a compact disk or other (magneto) optical media. The hard disk drive **127**, magnetic disk drive **128**, and (magneto) optical disk drive **130** may be coupled with the system bus **123** by a hard disk drive interface **132**, a magnetic disk drive interface **133**, and a (magneto) optical drive interface **134**, respectively. The drives and their associated storage media provide nonvolatile (or persistent) storage of machine-readable instructions, data structures, program modules and other data for the personal computer **120**. Although the exemplary environment described herein employs a hard disk, a removable magnetic disk **129** and a removable optical disk **131**, those skilled in the art will appreciate that other types of storage media, such as magnetic cassettes, flash memory cards, digital video disks, Bernoulli cartridges, random access memories (RAMs), read only memories (ROM), and the like, may be used instead of, or in addition to, the storage devices introduced above.

A number of program modules may be stored on the hard disk **127**, magnetic disk **129**, (magneto) optical disk **131**, ROM **124** or RAM **125**, such as an operating system **135** (for example, Windows® NT®4.0, sold by Microsoft® Corporation of Redmond, Wash.), one or more application programs **136**, other program modules **137** (such as "Alice", which is a research system developed by the User Interface Group at Carnegie Mellon University available at www.Alice.org, OpenGL from Silicon Graphics Inc. of Mountain View Calif., or Direct 3D from Microsoft Corp. of Bellevue Wash.), and/or program data **138** for example.

A user may enter commands and information into the personal computer **120** through input devices, such as a keyboard **140**, a camera **141** and pointing device **142** for example. Other input devices (not shown) such as a microphone, joystick, game pad, satellite dish, scanner, a touch sensitive screen, accelerometers adapted to sense movements of the user or movements of a device, or the like may also be included. These and other input devices are often connected to the processing unit **121** through a serial port interface **146** coupled to the system bus. However, input devices may be connected by other interfaces, such as a parallel port, a game port, blue tooth connection or a universal serial bus (USB). For example, since the bandwidth of the camera **141** may be too great for the serial port, the video camera **141** may be coupled with the system bus **123** via a video capture card (not shown). The video monitor **147** or other type of display device may also be connected to the system bus **123** via an interface, such as a video adapter **148** for example. The video adapter **148** may include a graphics accelerator. One or more speaker **162** may be connected to the system bus **123** via a sound card **161** (e.g., a wave table synthesizer such as product number AWE64 Gold Card from Creative® Labs of Milpitas, Calif.). In addition to the monitor **147** and speaker(s) **162**, the personal computer **120** may include other peripheral output devices (not shown), such as a printer for example. As an alternative or an addition to the video monitor **147**, a stereo video output device, such as a head mounted display or LCD shutter glasses for example, could be used.

The personal computer **120** may operate in a networked environment that defines logical connections to one or more remote computers, such as a remote computer **149**. The remote computer **149** may be another personal computer, a server, a router, a network PC, a peer device or other common network node, and may include many or all of the elements

described above relative to the personal computer **120**, although only a memory storage device has been illustrated in FIG. **1**. The logical connections depicted in FIG. **2** include a local area network (LAN) **14** and a wide area network (WAN) **152**, an intranet and the Internet.

When used in a LAN, the personal computer **120** may be connected to the LAN **14** through a network interface adapter (or "NIC") **153**. When used in a WAN, such as the Internet, the personal computer **120** may include a modem **154** or other means for establishing communications over the wide area network **152** (e.g. Wi-Fi, WiMax . . .). The modem **154**, which may be internal or external, may be connected to the system bus **123** via the serial port interface **146**. In a networked environment, at least some of the program modules depicted relative to the personal computer **120** may be stored in the remote memory storage device. The network connections shown are exemplary and other means of establishing a communications link between the computers may be used.

The Interface

An interface program providing an interface for managing documents in accordance with an embodiment of the invention is installed on a machine e.g. a computer system. The interface can be programmed using various programming languages e.g. C++, Java or other suitable programming languages. Programming of these languages is well known in the art and is adapted to be readable to provide executable instructions to a hardware system and will not be further described therein. The interface might run through the operating system and the hardware of the computer system or, alternatively, through a network based system e.g. client-server, and/cloud computing system. The interface is adapted to manage documents, computer files, pictures, multimedia content, applications (i.e. computer programs), menu elements, sets of icons and other user-selectable elements in a comprehensive fashion.

Several embodiments follows: Documents are stored on a machine-readable medium and can be retrieved on demand when needed with the interface program. Documents are disposed in an axis-like layout providing a visually comprehensive display arrangement of the documents. The axis can, illustratively, among other possibilities, be based on a selection of attribute(s), tag(s), category(ies), owner of documents, a chronological order, a statistical order or an order representing an increasing file size. Combinations of the above-listed possible choices, inter alia, are possible if desired to build a query adapted to reduce the number of documents to be displayed on the axis. The axis thus helps the viewer to infer additional meaning from the comprehensive layout, consistent display and distribution of the documents thereon.

An axis is adapted to accommodate a single type of documents or, if desired, more than one type of documents, and/or a mix of documents, computer files, multimedia contents and/or user-selectable menu elements. Documents might overlap to squeeze more documents on the space available on the display. Magnification of selected documents on an array can be made to increase the level of details of the selected documents.

Using an axis of documents helps to meaningfully and intuitively display a group of documents. An axis of documents can be embodied as being a substantially linear distribution of documents adapted to dispose each document to be displayed on a line or on a curved line. A curved or a circular axis of documents is also contemplated to be within the scope of the present disclosure. The exact shape of the axis is secondary, what matters, inter alia, is that the layout structure of an axis provides a comprehensive suite of documents from which a viewer can infer an order, a sequence or a relationship between documents. The display of the axis of documents might be made in accordance with a predetermined order (e.g. chronologically), or not. A chronological distribution of documents can sort documents on a timeline. The chronological order can either be linear or non-linear; meaning that a unit of time has always the same graphical length on the display in the linear configuration. The non-linear configuration might non-evenly display similar units of time because the distribution of documents along the timeline prevails over the linearity of time. Another illustrative embodiment is a group of juxtaposed axes of documents grouped together to form an array of documents referring to a matrix of documents.

The display of documents on an array of documents allows to contextually managing documents as a flow, or an ongoing suite, of documents instead of dealing with each document independently. By getting away from managing each document independently it becomes possible to efficiently deal with a significantly higher number of documents and still keep the documents in a structured order.

Each axis of documents groups documents in accordance with, for example, a selected tag, a category, keywords, or an attribute that is commonly shared among the documents displayed on the axis of documents. The term "attribute" will consistently be used throughout the instant specification to lighten the reading of the text and will include the other commonality between documents described therein unless otherwise specified. The selection of one or more attribute (using Boolean logic for instant) determines which documents will be displayed on the array of documents. If no specific attribute is selected, then, the axis of documents displays all documents. Thus, all documents on the same axis of documents are normally associated with the selected set or combination of attributes (trivial data, like publicity or specific related information, could be added to an axis as long as the outcome remains a presentation of documents resulting from a query without departing from the scope of the present invention). In addition, a timeline can be used to determine the order of the suite of documents on the axis of documents. Chronological ordering is a very intuitive ordering to humans and is one of the preferred ways to present documents on an array of documents. In the case of a matrix of documents, then, one axis (e.g. horizontal direction) of the matrix can represent a timeline while the other axis (e.g. vertical direction, orthogonal, . . .) represents another criterion like, for example, the type of computer files each document relates to. The other axis can also use a timeline if desirable.

The attributes of a document can be selected to create another axis of documents. The attribute of a document from the newly created axis of documents can be selected to create an additional axis of documents and so on so forth. This is what could be called "relational navigation" and is well described in the United States patent application publication referred to at the beginning of the present patent specification. Hence, the user can "navigate" along axes of documents in accordance with their categorization to visualize the documents. Navigation tools are provided with the interface to allow navigation through various axes of documents, when a plurality of axes is enabled, and through the documents of a single axis of documents. In the context of the present invention, a single suite of documents forming an axis along a timeline is one of the preferred embodiments because it is easy to sequentially navigate throughout the documents disposed along the axis. Other graphical layouts of documents might become obvious for a skilled reader in light of the present application and would be considered within the scope of this application.

When only a portion of the axis is visible, a play of zoom, pan and movements along the axis allows a viewer to navigate on the axis and change the document(s) that is (are) displayed on the display. A small display area could display only one document from the axis of documents while the remaining documents from the axis of documents are not displayed but remain nonetheless at their respective "virtual" position on the axis and ready to be displayed if the axis is scrolled to show other documents. In other words, if we consider a mobile platform like a mobile phone having a small display, the small display area might allow to efficiently displaying only one document at the time. However, the displayed document being part of an axis of documents, the other documents on the axis of documents remain displayable in accordance with their respective position on the axis of documents when the axis is scrolled/navigated/gestured.

Referring now to FIG. **4**, it is possible to appreciate an embodiment depicting a plurality of documents **200** disposed on an axis of documents **210**. Rails (or borders) **215** circumscribe the sides of the axis of documents **210** illustrated in FIG. **4**. Each document **200** is respectively associated with one or many attributes represented herein by capital letters e.g. A, B, C, D, E, F, G and H. In the axis of documents **210** illustrated in FIG. **4**, all documents **200** share the same set of attributes. Therefore, the query used to filter the documents could have been "A AND B AND C AND D AND E AND F AND G AND H", or "A OR B OR C OR D OR E OR F OR G OR H", for instance.

Turning now to FIG. **5** illustrating another series of documents **200** on an axis of documents **210**. The documents **200** on this axis of documents **210** are associated with various subsets of attributes for the benefit of the present description. One can notice that the lower rail **215** of the axis of documents **210** have a triangular identification **220** on its left side. The triangular identification **220** of the present embodiment can be of a different nature and is used to indicate that the axis of documents **210** can be expanded into at least one array of document subset (not shown in FIG. **5**) that can be called a "child" axis **210** of documents **200** as opposed to a "parent" axis **210** from which the child axis depends from. In the present situation, the number of additional available axes **210** is "two" as indicated in the triangle of the triangular identification **220**. The triangular identification **220** used in the Figures is not intended to be restrictive. Any other shape, size or location on a display having a similarly meaning remains within the scope of the present application. The triangular identification **220** is going to be referred herein below as an expansion actuator **220**.

The shape of the expansion actuator **220** is disposed toward a first horizontal direction **225** indicating that there are hidden children axes of documents. A selection of the expansion actuator **220** by a pointing device (not illustrated), hand gestures, or by any other means, is going to expand the children axes of documents as it can be appreciated in FIG. **6**. The expansion actuator **220** can remain fixed on the display in a first embodiment when the axes **210** are moving longitudinally. In an alternate embodiment, the expansion actuator **220** can move with the axes **210** when its related axes **220** are moving longitudinally.

The expansion actuator **220** is now disposed toward a vertical direction **230** inferring that the children axes of documents **235** are expanded, thus visible below the parent axis **250**. In contrast, in another embodiment, the expansion of the children axes could be made toward the opposite direction, above the parent axis, on in a "dept-like" direction emulating a third dimension thereof. A children axes group link **240** and a cooperating opposite expansion actuator **245** are visually defining the subset of children axes of documents **235** associated with parent axis of documents **250**. In the present situation, the upper child axis of documents **235.1** has a subset of documents from the parent axis of documents **250** that comprises the attribute "A" represented in bold in each document. Similarly, the lower child axis of documents **235.2** has a subset of documents from the parent axis of documents **250** that comprises the attribute "B" represented in bold in each document. As it can be appreciated, all documents are found in parent axis of documents **250**.

Still in FIG. **6**, one can appreciate the documents in the children axes of documents **235** are vertically aligned with their respective copies in the parent axes of documents **250**. This vertical alignment helps a viewer to quickly figure out which documents from the parent axis of documents **250** are found in each children axes of documents **235**. It is thus clear from the present example that the last three documents to the right **255** do not have the attribute A and the attribute B associated therewith.

A second selection of the expansion actuator **220**, of the group link **240** or of the cooperating opposite expansion actuator **245** is going to collapse and hide the children axes of documents **235**. Animation of the expansion phase, or the collapsible phase, of the children axes of documents **235** can be performed to further improve the perception of a viewer by further appreciating where the newly visible children axes of documents **235** are coming from or getting back to.

A different number of children axes of documents **235** can be displayed as illustrated in FIG. **7** where six (6) children axes of documents **235.1** through **235.6** are displayed. Each child axis of documents **235** sorting documents having a particular attribute associated therewith as expressed in the following Table 1:

TABLE 1

Child Axis of Documents	Query Attribute	Display Array
235.1	A	yes
235.2	B	yes
235.3	C	yes
235.4	D	yes
235.5	E	yes
235.6	F	yes
235.7	G	no

Of course a seventh child axis of documents **235.7** displaying the documents having the attribute G associated therewith could be displayed. A dialogue similar to the exemplary Table 1. A user can preset which children axes of documents **235** s/he wants to see by building and saving the queries for each children axis **235**. A dialogue (not illustrated in the Figures) can be displayed when selecting the expansion actuator **220** with a right click of a mouse, hand gesture, or the like. The dialogue can offer which child(ren) axis(es) **235** is (are) to be displayed when the children axes of documents **235** are expanded. Further, the user of the interface can close undesired expanded children axes of documents **235** by selecting the closing icon **260** located on the upper left portion of each expanded child axis of documents **235**. In so doing, only the desired children axes of documents **235** remains visible and use the visible area of the display. An additional axis **235** of documents **200** that collects and displays documents that are not displayed on any other axes of documents **235**. In other words it is possible to have an axis of documents **235** that is left outside the query used to select the documents **200** present on all other axes of documents **200**.

An alternative embodiment provides a supplemental sub-axis of documents that represents the remainder documents of the parent axis of document. By example, in FIG. **7**, such axis of documents would have the filter "(NOT A) AND (NOT B) AND (NOT C) AND (NOT D) AND (NOT E) AND (NOT F)" and would provide documents not present in axes having respectively the attributes A, B, C, D, E and F.

One can also appreciate from FIG. **7** that the disposition of documents **200** along axes are also defining columns thereof. Each column being associated with a single document. This is graphically facilitating the visual recognition of the presence or not of a document on each axis. It can easily be appreciated that the document solely having the attribute "A" is only present in axis **235.1** or that the second document from the left is present in all the child arrays of documents.

A series of time separators **265** are shown in FIG. **8** illustrating another embodiment. Time separators **265** are used to mark the end of a time period **270** and the beginning of another time period **270**. In the illustrative embodiment in FIG. **8**, the time separators **265** pass across all axes of documents **210**, **250**, **235**. This is one means to graphically help a viewer to figure out when each document **200** timely relates along a timeline **275** when the axes of documents **210**, **235**, **250** are illustrating documents along a chronological order. Similarly, in another unillustrated embodiment, separators used to partition axes in accordance with another criterion that time could separate documents along axes. For instance, documents owners, manufacturing sequences and so on so forth.

One embodiment could present the documents justified to the right, in contrast with the justification to the left embodied in FIG. **8**, of the time periods on the axes.

Another embodiment of is presenting documents on the axes of FIG. **8**, in respect with the time periods, vertically aligned with same documents and further longitudinally disposed on their respective axis in respect with their timely location on the axes. This embodiment can be interpreted from FIG. **8** although it is not exactly depicted therein.

FIG. **9** illustrates another embodiment where the documents **200** displayed on their respective children axes of documents **235** are all grouped on the left side thereof. This might be useful to compact documents on the axes of documents **235** despite it could be harder to appreciate where in time each document **200** relates and from which document **200** on the parent array of documents **250** it is a copy of—since the vertical alignment is not there anymore.

All the documents found in the parent axis of documents **250** can virtually be repeated in the children axes of documents **235**. Therefore, displaying the parent axis of documents **250** might not be necessary and its removal would save space on the display. The illustrative example of FIG. **10** shows that the parent axis of documents **250** can be collapsed. A cooperating parent expansion actuator **280** disposed adjacent to the expansion actuator **220** can be added to offer a user to collapse, or expand, the parent axis of documents **250**. In the present embodiment the parent axis expansion actuator **280** and the children axes expansion actuator **220** are graphically associated with the upper child axis of documents **235.1**. The two expansion actuators, for the parent **280** and the children **240** axes, can be actuated simultaneously upon actuation of one of them to provide an automatic optimization of the display area used to display the axes.

The explanation functions described above are directed to a parent axis of documents **250** having the capability to expand into a plurality of children axes of documents **235**. This is one "genealogy" level of axes of documents **250**, **235**. Additional levels of axes genealogy can be provided by the present invention. When a further genealogy levels can be provided when desirable using a mechanism comparable to the mechanism detailed above in respect of a single axis genealogy level. However, as it can be seen in FIG. **11**, a second level of expansion actuators **220.1** and **220.2** can be added adjacent to the first level of expansion actuator **220**. In an embodiment, a lateral indentation is desirable to properly illustrate the various possible levels of expansion. The expansion actuators **220** are adjacent, attached or graphically associated in some ways to their related axes of documents **250**, **235** to clearly identify to which axis of documents they relate. A different line type or other visual distinctive features can be used to emphasis the distinct genealogy levels associated with parent **250** and children axes of documents **235**.

FIG. **12** illustrates the same axes of documents layout as the layout illustrated in FIG. **11** with at least the difference that the child axes of documents **235.1** are expanded in two sub-child arrays of documents **235.1.1** and **235.1.2**. The second level of sub-child axes of documents **235.1.1** and **235.1.2** is clearly defined with the second level of expansion actuators **220.1** and **220.2** disposed adjacent to the first level of expansion actuator **220**. A second group link **240.1** interconnecting the two ends of the expanded expansion actuator **220.1** is used to visually identify the second level of child axes of documents **235.1.1** and **235.1.2**.

Still of FIG. **12**, one can appreciate a Boolean logic mechanism that is adapted to apply a filter using attribute "A" of axis of documents **250** to obtain children axis of document **235.1**. The same Boolean logic is used to get grandchildren axes **235.1.1** and **235.1.2**. The first grandchild axis **235.1.1** of documents have a filter defined as attributes "A AND C", while the second grandchild axis **235.1.2** axis of documents filters documents on a basis of attributes "A AND G". In the illustrated embodiment, both grandchild axes **235.1.1** and **235.1.2** have attribute A because they are refined from child array **235.1**. In contrast, another embodiment could provide grandchildren axes that do not require the parent to exhaustively posses all their documents **200**.

An alternative embodiment provides a supplemental sub-axis of documents that represents the remainder documents of the parent axis of document. For example, such axis of documents would have the filter "A AND (NOT B) AND (NOT C)".

The illustrative example of FIG. **13** shows that the parent axis of documents **250** and the child axis of documents **235.1**, that has its own expanded grandchildren axes of documents **235.1.1** and **235.1.2**, can both be simultaneously collapsed. As previously indicated, the cooperating parent expansion actuator **280** disposed adjacent to the expansion actuator **220** is added to offer a user to collapse or expand the parent axis of documents **250**. Similarly, a cooperating parent expansion actuator **280.1** disposed adjacent to the child expansion actuator **220.1** is added to offer a user to collapse or expand the child axis of documents **250.1** in respect with its own sub-child axes of documents **235.1.1** and **235.1.2**. In the present embodiment the parent expansion actuator **280** and the expansion actuator **220** are graphically associated with the upper child axis of documents **235.1**.

Turning now to FIG. **14** illustrating the same embodiments as in FIG. **13**. However, in FIG. **14**, the child axis of documents **235.2**, which is collapsed in this Figure, has expanded grandchildren axes of documents **235.2.1** and **235.2.2**. The same cooperating parent expansion actuator **280.2** disposed adjacent to the child expansion actuator **220.2** is added to offer a user a possibility to collapse or expand the child axis of

documents **235.2** in respect with its own grand-child axes of documents **235.2.1** and **235.2.2**.

A third level of expansion based on the grandchild axis of documents **235.1.2** is illustrated in FIG. **15**. One grand-grand child axis of documents **235.1.2.1** is displayed with associated cooperating grandchild expansion actuator **220.1.2** to offer a user to collapse or expand the grandchild axis of documents **235.1.2** in respect with its own grand-grand-child array of documents **235.1.2.1**.

The grand-grand-child array of documents **235.1.2.1** inherits all its ancestors' filters (A AND G) and adds its own filter (C) to become "A AND G AND C". This rule may be applied to all descendant axes of documents. It is understood that parent-child, child-grand child and grand-grand child wording is used for illustrating purposes and that other names could be given to axes structures without departing from the scope of the present invention.

Another exemplary embodiment is illustrated in FIG. **16** to show that a group of axes of documents **300** can be expanded and collapsed. A group header **310** illustratively represents the group of axes of documents A **300**. In the present embodiment Group A **300** as a single axis of documents **310** displaying a plurality of documents. A group expansion actuator **320** is added to offer a user to collapse or expand the axis of documents **310**.

Again, as for expansion and collapsing of arrays of documents discussed above, the Group of axes A **300** can accommodate a number of different axes of documents. In the illustrative example of FIG. **17**, Group A **300** comprises three axes of documents **310**, **312** and **314**. These three axes of documents **310**, **312** and **314** are expanded in FIG. **17** with associated expansion actuators **320** and group link **340** interconnecting the expansion actuators **320**.

FIG. **18** illustrates completely collapsed Group A **300** to prevent using precious useful display area when the actual axes of documents **310**, **312** and **314** are not required to be visible on the display. However, the collapsed Group A **300** of axes of documents remains visible on the display to quickly access its associated axes of documents **310**, **312** and **314** when required. The header **305** of the Group **310** remains visible when the axes of documents **310**, **312** and **314** are collapsed to be used when desirable without having to perform further actions to get the Group **300** or its associated arrays. In the present embodiment, group header **305** displays some information about its content. For example, the header **305** informs the viewer of the number of arrays therein **312** and the query of the arrays **315**.

The collapsed header **305** can also be considered to comprise all axes therein. The expansion of the axes under the header **305** will distribute documents **200** contained under the header **305** over one, or a plurality, of axes. Similarly, in another embodiment, the collapsed header **305** can also be considered as comprising all documents **200** therein irrespective of their associated axes. In the latter situation, a collapsed header **305** could be expanded in a single axis having all documents **200** found under the group header **305**.

Two parent-children axes relations can illustratively be described. The first relation uses documents in the children axes that are present in the parent axis and have an additional attribute to be sorted with. For example, the parent axis can have only documents having the attribute Q, while the children axes respectively have documents having attributes "Q AND A", "Q AND B", and "Q AND C". The second relation does not further refine documents from the parent axis as the first relation does. For example, the parent axis can have documents having attribute "A OR B OR C" and the children respectively have attribute "A", "B", and "C".

Turning now to FIG. **19** illustrating two distinct groups of axes **305.1** and **305.2** shown in the same display area (not illustrated but it is understood that all the axes are displayed on a display). Each group **305** could alternatively be displayed in separate adjacent windows or on different displays (e.g. multi-display setup). The two groups of axes of documents **305.1** and **305.2** can accommodate a single or a plurality of axes of documents **310**, **312**, **314**, **316**. The two groups have their own respective headers **305.1** and **305.2** to show an identification of the group. Each group may comprise multiple levels of expansion of axes of documents. In this illustrative example, Group A **300.1** is shown to have two axes of documents **310** and **312** using a single level of expansion while Group B **300.2** have also two different axes of documents **314** and **316** still on a single level of expansion. Each group **300** is provided with a respective group expansion actuator **320** to offer the possibility to the user to act and collapse/expand each group **300**, separately.

It can be noted that, despite it is not illustrated in FIG. **19** and FIG. **20**, that each axis of documents **310**, **312**, **314**, **316** can also be expanded/collapsed if configured to do so as explained above without departing from the scope of the present invention.

FIG. **20** shows the same two groups **300.1** and **300.2** with the first group **300.1** in the collapsed configuration. The two axes of document **310** and **312** in collapsed group A **300.1** shown in FIG. **19** are now hidden. Group's A **300.1** header **305.1** remains visible to indicate the presence of the group on the display despite it is in its contracted configuration. The contracted group A **300.1** takes less space that remain available for other groups or axes to be used while it remains easily accessible for a user to expand it again to use/manipulate documents included in group A **300.1**. The group expansion actuator **320.1** have changed orientation to inform a user that group A **305.1** is in its collapsed configuration and offer him to expand back the axis of documents **310**, **312** associated therein. The group expansion actuators **320.2** remains in its expanded position since only group A **300.1** is collapsed and group B **300.2** is expanded.

The expansion and collapsing of both axes of documents and groups of documents are advantageous to rapidly use and leave display area in accordance with the desire of a user. This is a quick and efficient way to change the information displayed on a display while keeping accessible on the display a reduced version of the information presented either by a group or an array of documents. This "blind actuation" effect can be animated such that the user really has the perception that a precise group or axis of documents is expanding or collapsing.

An alternative embodiment is to offer to a user to create children of an axis of documents from the conjunctive parts of the disjunctive normal form of the Boolean expression of the parent axis of document. (We may calculate the disjunctive normal form of any Boolean expression by using well known techniques that can be automated in Boolean logic such applying a combination of De Morgan's laws and distributive laws or extracting the conjunction parts from a table of truth.) The result should be axes of documents with conjunctive only Boolean expressions. By example, if the parent axis of documents have filters "A AND (B OR C)", the user may create to children axis of document having respectively filter "A AND B" and "A AND C". These conjunctive only Boolean expressions axes have many interesting properties to the user, such as know on which condition a document is valuated to be part of the parent complex Boolean expression, or affecting all the attributes of one of the children of the axis of document to be part of the result.

An additional embodiment provides to mechanism adapted to drag and drop documents on axes that is going to associate the set of attributes to the dragged document. For instance, if a document is dragged in a parent axis having the attributes "A AND (B OR C)", it is going to be copied in the children axes respectively having attributes "A AND B" and "A AND C".

Another embodiment is illustrated in FIG. **21**. This embodiment of the invention provides a mechanism for combining two axes into one axis. The first axis **310** is graphically discriminated from the second axis **312** by using a visual distinctive feature (VDF). In this embodiment the VDF is transposed in a vertical displacement. The documents **200** from axis **310** are therefore displayed higher compared to the documents from axis **312** as illustrated in FIG. **22**.

FIG. **23** adds another exemplary VDF. A frame is added on documents to further graphically discriminate some documents. The further discrimination could be based on attributes associated with documents.

Further adaptations of VDF applied to the first and the second axis as illustrated in FIG. **24** can be applied to the respective documents in the combined axis of FIG. **25**.

Time separators are added to the first and the second axis **310**, **312** in FIG. **26** and applied on the combined axis of FIG. **27**.

A different embodiment is illustrated in FIG. **28**. The axes **310**, **312**, **314** of group **300** are adapted to collapse by illustratively actuate a collapse actuator **350** to keep only the group header **305** as illustrated in FIG. **29**.

FIGS. **30**, **31** and **32** are concerned with a horizontal collapse **360** to only keep a visual portion of the group header **305** as illustrated in FIG. **30**. The same principle can be applied simultaneously with a plurality of group headers **305** as exemplified in FIG. **31**. The horizontal collapse can also be applied on a group **305** with one or a plurality of axes **310**, **312**, **314**; see FIG. **32**.

FIGS. **33** through **37** are illustrating exemplary steps of various embodiments of the invention to complement the aforementioned description.

The description and the drawings that are presented above are meant to be illustrative of the present invention. They are not meant to be limiting of the scope of the present invention. Modifications to the embodiments described may be made without departing from the present invention, the scope of which is defined by the following claims:

What is claimed is:

1. An apparatus for implementing a user interface adapted to display a plurality of substantially rectilinear arrays of user-selectable elements on a display, the apparatus comprising:

a memory module; and

a processing unit in communication with the memory module, the processing unit being operative for executing computer readable program code stored on a non-transient computer readable medium for implementing

a method comprising,

displaying a first expandable array of user-selectable elements displaying a plurality of user-selectable elements along a substantially rectilinear orientation on the display, each user-selectable element of which array is associated with one or more attributes, all user-selectable elements of which array share in common one or more attributes,

displaying an expansion actuator with the first expandable array, and

in response to selection of the expansion actuator by a user, displaying a first additional array of user-selectable elements displaying a plurality of user-selectable elements along a substantially rectilinear orientation on the display, the first additional array of user-selectable elements being adjacent and parallel from the first expandable array of user-selectable elements, wherein all user-selectable elements of the first additional array that is displayed in response to the selection of the expansion actuator share in common one or more attributes, and wherein each user-selectable element of the first additional array that is displayed in response to the selection of the expansion actuator comprises a user-selectable element of the first expandable array of user-selectable elements, and

in further response to selection of the expansion actuator, displaying a second additional array of user-selectable elements displaying a plurality of user-selectable elements along a substantially rectilinear orientation on the display, the second additional array of user-selectable elements being adjacent and parallel from the first additional array of user-selectable elements, wherein all user-selectable elements of the second additional array that is displayed in response to the selection of the expansion actuator share in common one or more attributes, and wherein each user-selectable element of the second additional array that is displayed in response to the selection of the expansion actuator is a user-selectable element of the first expandable array,

whereby the first expandable array is expandable by selection of the expansion actuator to display subsets thereof, each of which subsets is based on commonality of one or more attributes.

2. The apparatus of claim **1**, further comprising displaying an expansion actuator with the first additional array, and in response to selection of the expansion actuator displayed with the first additional array, displaying another array of user-selectable elements, all user-selectable elements thereof sharing in common one or more attributes, and each user-selectable element thereof being a user-selectable element of the first expandable array.

3. The apparatus of claim **1**, further comprising, in response to selection of the expansion actuator, displaying a second additional array of user-selectable elements, wherein all user-selectable elements of the second additional array that is displayed in response to the selection of the expansion actuator share in common one or more attributes, and wherein each user-selectable element of the second additional array that is displayed in response to the selection of the expansion actuator is a user-selectable element of the first expandable array.

4. The apparatus of claim **3**, further comprising displaying an expansion actuator with the second additional array, and in response to selection of the expansion actuator displayed with the second additional array, displaying another array of user-selectable elements, all user-selectable elements thereof sharing in common one or more attributes, and each user-selectable element thereof being a user-selectable element of the first expandable array.

5. The apparatus of claim **3**, further comprising displaying an expansion actuator with the first additional array, and in response to selection of the expansion actuator displayed with the first additional array, displaying another array of user-selectable elements, all user-selectable elements thereof sharing in common one or more attributes, and each user-selectable element thereof being a user-selectable element of the first expandable array.

6. The apparatus of claim 5, further comprising displaying an expansion actuator with the second additional array, and in response to selection of the expansion actuator displayed with the second additional array, displaying another array of user-selectable elements, all user-selectable elements thereof sharing in common one or more attributes, and each user-selectable element thereof being a user-selectable element of the first expandable array.

7. The apparatus of claim 1, further comprising, in response to selection of the expansion actuator, displaying a third additional array of user-selectable elements, wherein all user-selectable elements of the third additional array that is displayed in response to the selection of the expansion actuator share in common one or more attributes, and wherein each user-selectable element of the third additional array that is displayed in response to the selection of the expansion actuator is a user-selectable element of the first expandable array.

8. The apparatus of claim 7, further comprising, displaying a closing icon with the first additional array, and hiding from view the first additional array upon selection of the closing icon associated therewith;

displaying a closing icon with the second additional array, and hiding from view the second additional array upon selection of the closing icon associated therewith; and

displaying a closing icon with the third additional array, and hiding from view the third additional array upon selection of the closing icon associated therewith.

9. The apparatus of claim 1, wherein the first expandable array and the first additional array are displayed with a common timeline.

10. The apparatus of claim 1, further comprising determining the user-selectable elements of the first additional expandable array by performing a search upon the selection of the expansion actuator by the user.

11. The apparatus of claim 1, further comprising determining the user-selectable elements of the additional array by performing an additional search upon the selection of the expansion actuator by the user.

12. The apparatus of claim 1, further comprising displaying the first additional array under and at an indentation to the first expandable array.

13. The apparatus of claim 1, further comprising displaying the second additional array under and at an indentation to the first expandable array.

14. The apparatus of claim 1, further comprising determining any user-selectable elements of the first expandable array that are not included in any additional array, and displaying on a new array such determined user-selectable elements.

15. A method of displaying a plurality of substantially rectilinear arrays of user-selectable elements on a display, the method comprising:

displaying a first expandable array of user-selectable elements displaying a plurality of user-selectable elements along a substantially rectilinear orientation on the display, each user-selectable element of which array is associated with one or more attributes, all user-selectable elements of which array share in common one or more attributes,

displaying an expansion actuator, and

in response to selection by a user of the expansion actuator, displaying a first additional array of user-selectable elements displaying a plurality of user-selectable elements along a substantially rectilinear orientation on the display, the first additional array of user-selectable elements being adjacent and parallel from the first expandable array of user-selectable elements, wherein all user-selectable elements of the first additional array that is displayed in response to the selection of the expansion actuator share in common one or more attributes, and wherein each user-selectable element of the first additional array that is displayed in response to the selection of the expansion actuator is a user-selectable element of the first expandable array.

16. The method of claim 15, further comprising displaying an expansion actuator with the first additional array, and in response to selection of the expansion actuator displayed with the first additional array, displaying another array of user-selectable elements, all user-selectable elements thereof sharing in common one or more attributes, and each user-selectable element thereof being a user-selectable element of the first expandable array.

17. The method of claim 15, further comprising, in response to selection of the expansion actuator, displaying a second additional array of user-selectable elements, wherein all user-selectable elements of the second additional array that is displayed in response to the selection of the expansion actuator share in common one or more attributes, and wherein each user-selectable element of the second additional array that is displayed in response to the selection of the expansion actuator is a user-selectable element of the first expandable array.

18. The method of claim 15, further comprising determining the one or more attributes shared in common by all user-selectable elements of the first expandable array by performing a search query; and determining the one or more attributes shared in common by all user-selectable elements of the first additional array by performing an additional search query.

19. The method of claim 15, further comprising determining any user-selectable elements of the first expandable array that are not included in any additional array, and displaying on a new array such determined user-selectable elements.

20. A method of displaying an array of user-selectable elements on a display, the method comprising:

displaying a first expandable array of user-selectable elements displaying a plurality of user-selectable elements along a substantially rectilinear orientation on the display, each user-selectable element of which array is associated with one or more attributes, all user-selectable elements of which array share in common one or more attributes,

displaying an expansion actuator with the first expandable array, and

in response to selection by a user of the expansion actuator, displaying a first additional array of user-selectable elements displaying a plurality of user-selectable elements along a substantially rectilinear orientation on the display, the first additional array of user-selectable elements being parallel from the first expandable array of user-selectable selectable elements, wherein all user-selectable elements of the first additional array that is displayed in response to the selection of the expansion actuator share in common one or more attributes, and wherein each user-selectable element of the first additional array that is displayed in response to the selection of the expansion actuator is a user-selectable element of the first expandable array, and further displaying an expansion actuator with the first additional array, and in response to selection by a user of the expansion actuator displayed with the first additional array, displaying another array of user-selectable elements, all user-selectable elements thereof sharing in common one or more attributes, and each user-selectable element thereof being a user-selectable element of the first expandable array,

displaying a second additional array of user-selectable elements displaying a plurality of user-selectable elements along a substantially rectilinear orientation on the display, the second additional array of user-selectable elements being parallel from the first additional array of user-selectable elements, wherein all user-selectable elements of the second additional array that is displayed in response to the selection of the expansion actuator share in common one or more attributes, and wherein each user-selectable element of the second additional array that is displayed in response to the selection of the expansion actuator is a user-selectable element of the first expandable array, and further displaying an expansion actuator with the second additional array, and in response to selection by a user of the expansion actuator displayed with the second additional array, displaying another array of user-selectable elements, all user-selectable elements thereof sharing in common one or more attributes, and each user-selectable element thereof being a user-selectable element of the first expandable array, and

aligning any user-selectable elements of the expandable arrays with corresponding user-selectable elements of the first expandable array of user-selectable elements.

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